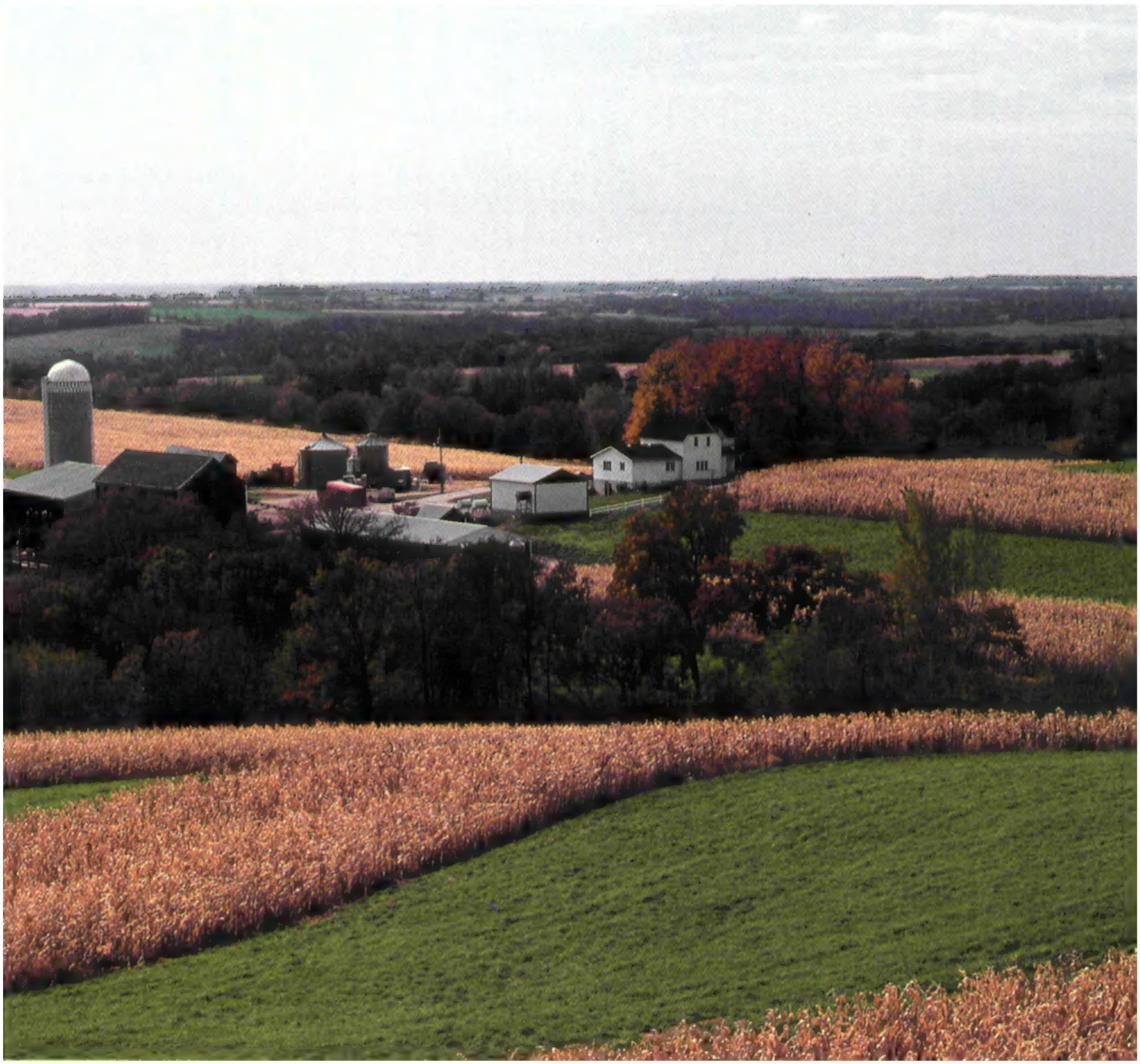
USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Allamakee County, Iowa

Part I



How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, which is the color map preceding the detailed soil maps, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1984-89. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. It is part of the technical assistance furnished to the Allamakee County Soil and Water Conservation District. Funds appropriated by Allamakee County were used to defray part of the cost of the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An area of the Fayette-Nordness-Dubuque association in Allamakee County. Strips of corn, oats, and hay planted on the contour help to control erosion in these gently rolling to hilly areas.

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Issued 1998

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Foreword

This soil survey contains information that can be used in land-planning programs in Allamakee County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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Soil Survey of Allamakee County, Iowa

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey

area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Nature of the Survey Area

Allamakee County is in the northeast corner of Iowa (fig. I-1). It is bordered on the north by Houston County, Minnesota; on the south by Clayton County, Iowa; and on the west by Winneshiek County, Iowa. The Mississippi River forms the eastern boundary with Vernon and Crawford Counties, Wisconsin.

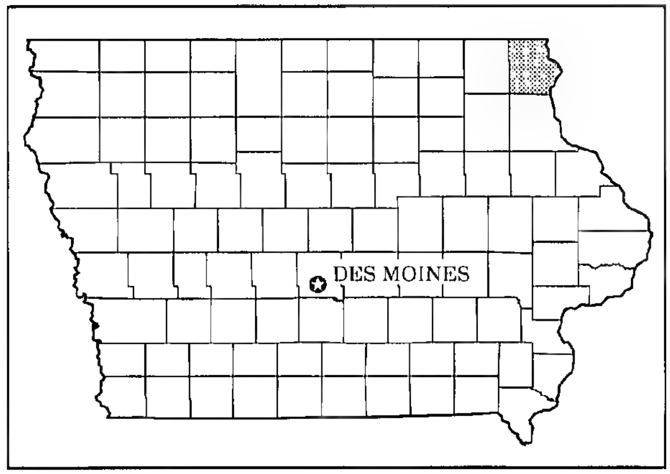

Figure I-1.—Location of Allamakee County in Iowa.

Allamakee County has an area of about 422,200 acres, or approximately 660 square miles. In 1980, the population of the county was 15,108. The population has been steadily decreasing since 1880, when it reached a peak of 19,791. In 1980, Waukon, the county seat, had a population of 3,983, or about 25 percent of the total population of the county. About 28 percent of the people lived on farms at this time (Iowa Department of Economic Development, 1987).

About 52 percent of the county is cropland, 40 percent is woodland, 7 percent is permanent pasture, and 1 percent is urban land. Dairy farming, raising cattle for beef, and raising hogs for pork are the principal farming enterprises (Clements, 1988).

This soil survey updates the survey of Allamakee County published in 1958. It provides additional information and has larger maps, which show the soils in greater detail (Scholtes and others, 1958).

History

Native Americans have been an important part of Allamakee County history for the past 12,000 years or more. The extensive system of ceremonial mounds at Effigy Mounds National Monument is testimony to the tribes that lived in the area 2,500 years ago. The tribes of the Dakotas were the dominant tribes in recent history.

Because the high bluffs along the Mississippi River and the thick forests made access to the area very difficult, the exploration of the survey area by early pioneers was delayed. Areas to the north and south were explored and settled first. The earliest permanent European settlement was at the Indian Mission on the Yellow River in 1833.

Allamakee County was established in February of 1847. Scott Shattuck and his family were the first immigrants to settle in the county. They settled on the relatively flat plains in the center of the county at the site of the present county seat, Waukon. Waukon was platted and designated as the county seat in 1853.

Farming, Natural Resources, and Transportation Facilities

Farming is of major economic importance in Allamakee County. It provides a livelihood not only for farmers but also for many involved in agribusiness.

Because of the steepness of most of the farm ground in the county, raising beef cattle and hogs and dairy farming are the principal farming enterprises. In 1985, there were 1,100 farms in the county. The average farm size was 340 acres. Only 3 years before that, however, there were 1,170 farms with an average size of 325 acres.

Allamakee County has a variety of natural resources in addition to agricultural land. These include limestone, sand, gravel, trees, water, and natural beauty.

Limestone is near the surface in many areas throughout the county. The limestone is crushed and used commercially for road building or concrete and as a source of lime for agronomic uses. There are a few sand and gravel pits.

In 1988, commercial forest land totaled 100,300 acres, including 283,398 thousand board feet of sawtimber. There are two active wood products mills.

The natural beauty of the forests and limestone bluffs attracts many tourists to the county. The area along the Mississippi River has been called "Little Switzerland." Several parks have been developed on the scenic heights overlooking the Mississippi River and along Paint Creek. Prehistoric Native American heritage is preserved at Effigy Mounds National Monument.

Allamakee County is accessed by State highways 9, 51, and 76. There are 94 miles of State highways, 3 miles of U.S. highway, and 49 miles of municipal roads. Gravel and dirt roads provide access to even the most remote areas. The Northeast Regional Transit system serves the county. There is one bus system, and motor freight freely accesses all urban areas within the county.

There are two main rail freight lines. Public, unattended airports are in both Waukon and Postville. A barge terminal on the Mississippi River at Lansing provides fleeting/harbor services.

Physiography and Drainage

The topography in most of the county is characterized by rolling to hilly or steep relief. Typical upland features are narrow ridgetops bordered by steep side slopes having numerous outcrops of limestone and sandstone. The topography along the Mississippi River and the lower reaches of its tributaries is very steep and rugged. Limestone bluffs rise abruptly to a height of 300 feet above the Mississippi River.

In contrast, the topography in the west-central part of the county is characterized by gently rolling, undulating relief and areas pock-marked with sinkholes.

Sinkholes are scattered throughout the county, although they are concentrated in the west-central part of the county. They are a major factor in the drainage of the county. Many are open at the surface and are increasing in size. Others are mantled with soil material and are not growing. Some sinkholes are shallow and are cultivated, but many are deep and cannot be crossed by farm machinery. Each year several new sinkholes form, generally after a period of heavy precipitation.

Sinkholes may be a direct cause of underground water pollution. In a few areas, surface water that carries barnyard runoff, septic tank effluent, and agricultural chemicals drains into sinkholes. This surface runoff moves directly into underground water supplies and pollutes them to dangerous levels with these contaminants.

The principal watercourse in the county is the Mississippi River. The other major streams are the Upper Iowa River, the Yellow River, Village Creek, and Paint Creek, all of which drain into the Mississippi River. Slightly more than the upper one-third of the county is drained by the Upper Iowa River and its tributaries. The southern quarter of the county is drained by the Yellow River and its tributaries. The central quarter of the county is drained by Village and Paint Creeks. The rest of the county drains directly into the Mississippi River.

Climate

The three tables at the end of this section give climate data for the survey area as recorded at Waukon in the period 1961 to 1990.

In winter, the average temperature is 18 degrees F and the average daily minimum temperature is 10 degrees. The lowest temperature on record, which occurred at Waukon on January 30, 1951, is -31 degrees. In summer, the average temperature is 69 degrees and the average daily maximum temperature is 79 degrees. The highest temperature, which occurred at Waukon on August 17, 1988, is 99 degrees.

Growing degree days are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day

exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 29.54 inches. Of this, 22.24 inches, or 75 percent of the total, usually falls in April through September. The growing season for most crops falls within this period. The heaviest recorded 1-day rainfall was 4.72 inches at Waukon on August 6, 1951. Thunderstorms occur on about 40 days each year, and most occur in June.

The average seasonal snowfall is 28.8 inches. The greatest snow depth at any one time during the period of record was 23 inches. On the average, 13 days of the year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 14 inches.

The average relative humidity in midafternoon is about 61 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in April.

TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Waukon, Iowa)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	22.7	5.8	14.3	46	-26	0	0.47	0.16	0.79	1	6.5
February----	28.8	11.3	20.1	51	-20	0	.57	.27	.93	2	4.9
March-------	41.3	23.5	32.4	71	-6	11	1.60	.79	2.30	4	6.6
April-------	57.3	36.3	46.8	82	15	77	3.20	1.91	4.36	6	1.2
May---------	69.2	47.8	58.5	86	29	281	3.56	2.13	4.84	7	.0
June--------	77.4	57.2	67.3	91	42	516	4.18	2.25	5.88	7	.0
July--------	81.5	61.8	71.7	94	48	662	3.80	2.02	5.37	6	.0
August------	79.2	59.3	69.3	92	45	595	3.97	1.91	5.76	6	.0
September---	70.9	51.0	61.0	87	32	337	3.53	1.42	5.31	6	.0
October-----	60.2	40.1	50.2	82	21	116	2.19	1.07	3.16	5	.0
November----	43.1	26.6	34.9	65	0	9	1.61	.67	2.51	3	2.5
December----	27.4	12.1	19.8	54	-20	0	.86	.43	1.34	3	7.1
Yearly:											
Average---	54.9	36.1	45.5	---	---	---	---	---	---	---	---
Extreme---	---	---	---	95	-27	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,604	29.54	24.38	34.26	56	28.8

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Waukon, Iowa)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 19	May 2	May 16
2 years in 10 later than--	Apr. 15	Apr. 27	May 11
5 years in 10 later than--	Apr. 8	Apr. 17	Apr. 30
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 18	Oct. 3	Sept. 25
2 years in 10 earlier than--	Oct. 23	Oct. 9	Sept. 29
5 years in 10 earlier than--	Oct. 31	Oct. 19	Oct. 8

GROWING SEASON

(Recorded in the period 1961-90 at Waukon, Iowa)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	177	158	136
8 years in 10	182	165	144
5 years in 10	192	178	159
2 years in 10	202	190	174
1 year in 10	208	197	181

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Downs-Fayette Association

Setting

Landscape: Uplands
Slope range: 2 to 14 percent

Composition

Percent of survey area: 16 percent
Extent of components in the association:
Downs soils—50 percent
Fayette soils—35 percent
Minor soils—15 percent (fig. I-2)

Soil Properties and Qualities

Downs
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Divides, interfluves, side slopes, and head slopes
Hillslope position: Summits, shoulders, and back slopes
Slope: 2 to 14 percent
Parent material: Loess

Fayette
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Divides, interfluves, side slopes, and head slopes
Hillslope position: Summits, shoulders, and back slopes
Slope: 2 to 14 percent
Parent material: Loess

Minor Soils

- Frankville and similar soils
- Dubuque and similar soils
- Eitzen and similar soils
- Otter and similar soils
- Tama and similar soils
- Worthen and similar soils

2. Fayette-Nordness-Dubuque Association

Setting

Landscape: Uplands
Slope range: 5 to 40 percent

Composition

Percent of survey area: 25 percent
Extent of components in the association:
Fayette soils—45 percent
Nordness soils—20 percent
Dubuque soils—15 percent
Minor components—20 percent (fig. I-3)

Soil Properties and Qualities

Fayette
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and head slopes
Hillslope position: Shoulders and back slopes
Slope: 5 to 40 percent
Parent material: Loess (fig. I-4)

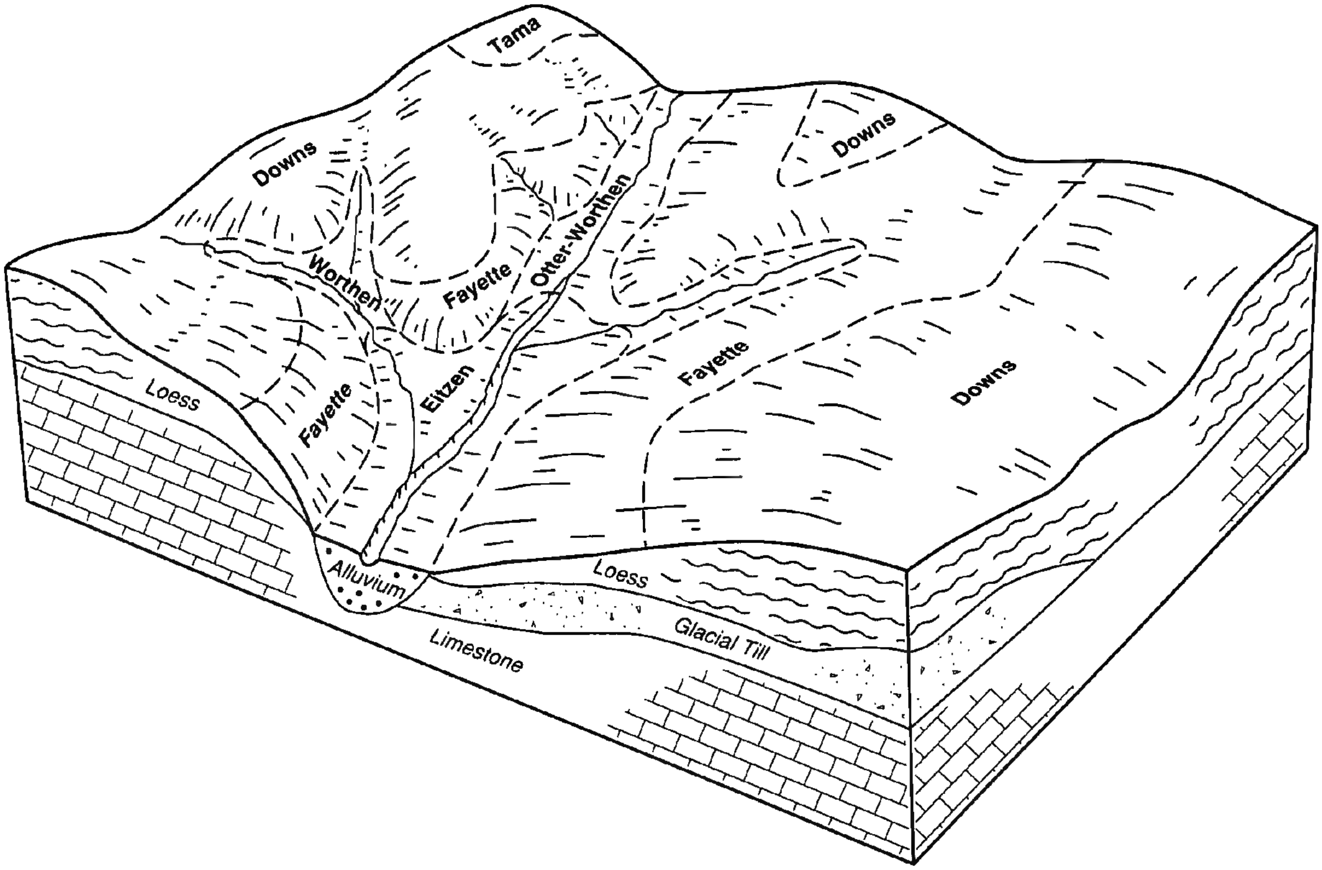

Figure I-2.—Typical pattern of soils and parent material in the Downs-Fayette association.

Nordness
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Slope: 5 to 40 percent
Parent material: Loamy pedisediments over limestone bedrock

Dubuque
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Slope: 5 to 25 percent
Parent material: Loess and a thin layer of clayey residuum over limestone bedrock

Minor Components

- Arenzville and similar soils
- Boone and similar soils
- Downs and similar soils
- Frankville and similar soils
- Rock outcrop
- Volney and similar soils

3. Lacrescent-Fayette-Village Association

Setting

Landscape: Uplands
Slope range: 5 to 70 percent

Composition

Percent of survey area: 45 percent
Extent of components in the association:
Lacrescent soils—40 percent

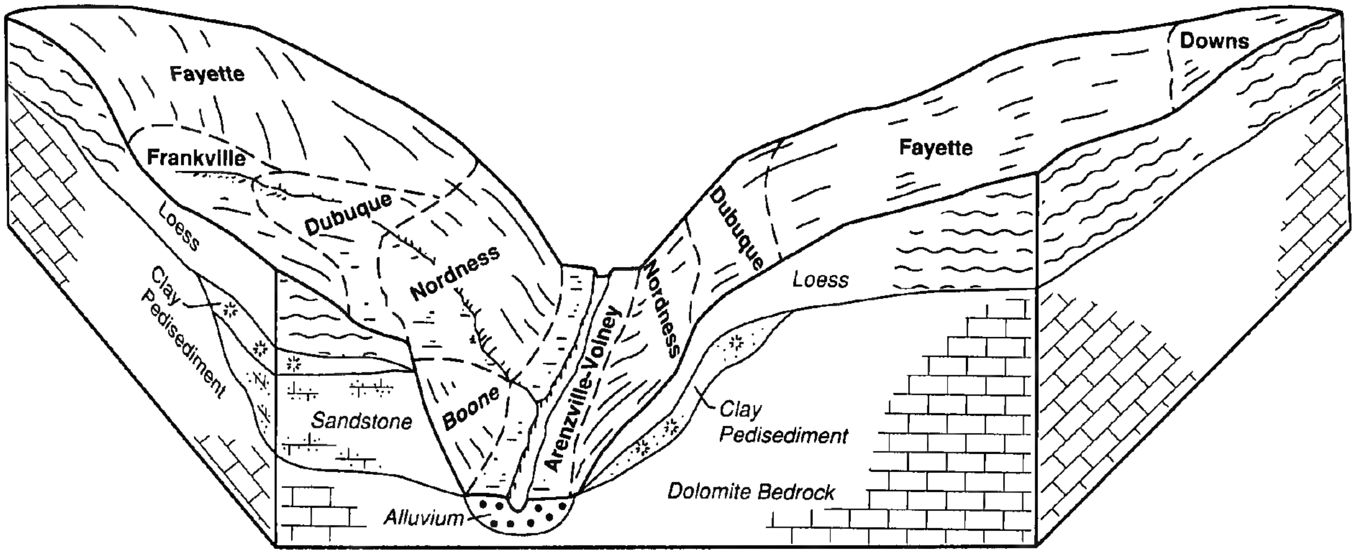

Figure I-3.—Typical pattern of soils and parent material in the Fayette-Nordness-Dubuque association.

Fayette soils—30 percent
Village soils—15 percent
Minor soils—15 percent (fig. I-5)

Soil Properties and Qualities

Lacrescent
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Back slopes
Slope: 14 to 70 percent
Parent material: Pedisediment

Fayette
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and head slopes
Hillslope position: Shoulders and back slopes
Slope: 5 to 40 percent
Parent material: Loess

Village
Drainage class: Well drained
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Slope: 5 to 25 percent
Parent material: Loess over residuum

Minor Soils

- Arenzville and similar soils
- Eitzen and similar soils
- Paintcreek and similar soils
- Volney and similar soils
- Yellowriver and similar soils

4. Ion-Eitzen-Bertrand Association

Setting

Landscape: Flood plains and stream terraces
Slope range: 0 to 5 percent

Composition

Percent of survey area: 6 percent
Extent of components in the association:
Ion soils—55 percent
Eitzen soils—25 percent
Bertrand soils—10 percent
Minor soils—10 percent

Soil Properties and Qualities

Ion
Drainage class: Moderately well drained
Landscape: Flood plains
Landform: Flood plains
Slope: 0 to 2 percent
Parent material: Alluvium

Eitzen
Drainage class: Moderately well drained

Figure I-4.—A cross section showing the loess parent material over limestone, shale, and sandstone bedrock in an area of Fayette soils.

Landscape: Flood plains
Landform: Flood plains
Slope: 0 to 2 percent
Parent material: Alluvium

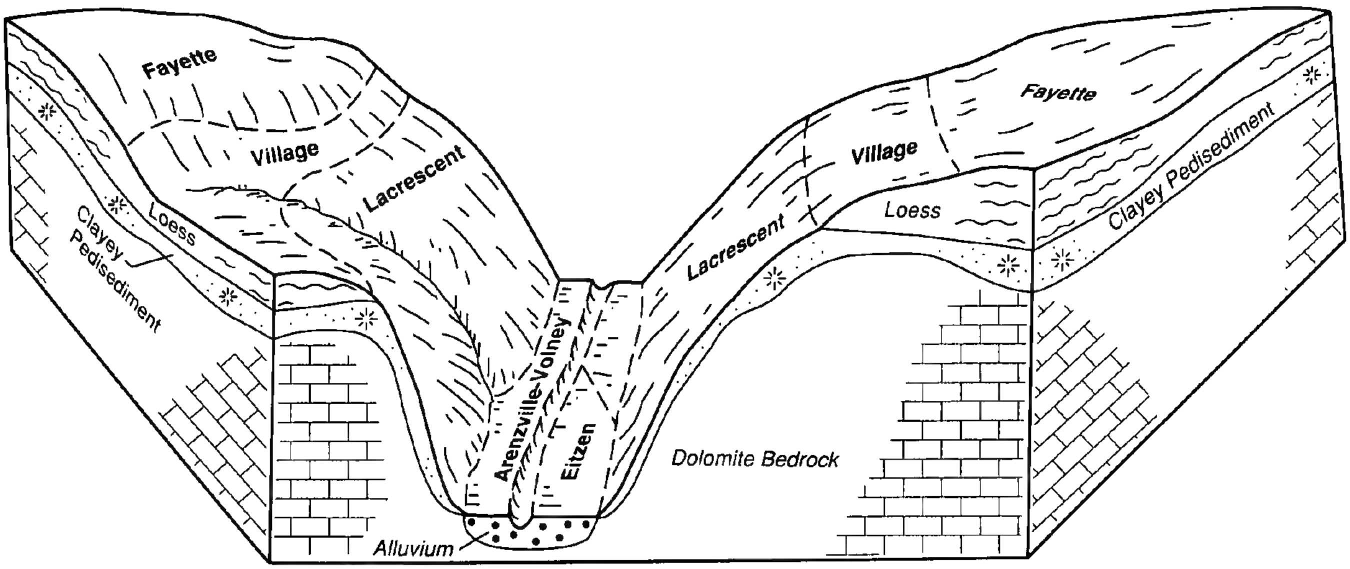

Figure I-5.—Typical pattern of soils and parent material in the Lacrescent-Fayette-Village association.

Bertrand
Drainage class: Well drained
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads and risers
Slope: 2 to 5 percent
Parent material: Silty alluvium over sand and gravel

Minor Soils

- Elon and similar soils
- Festina and similar soils

5. Chelsea-Sparta Association

Setting

Landscape: Stream terraces
Parent material: Alluvium
Slope range: 2 to 14 percent

Composition

Percent of survey area: 1 percent
Extent of components in the association:
Chelsea soils—50 percent
Sparta soils—40 percent
Minor soils—10 percent

Soil Properties and Qualities

Chelsea
Drainage class: Excessively drained
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads and risers
Slope: 2 to 14 percent
Parent material: Eolian and alluvial sandy sediment

Sparta
Drainage class: Excessively drained
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads and risers
Slope: 2 to 14 percent
Parent material: Eolian sand

Minor Soils

- Waukee and similar soils

6. Caneek Association

Setting

Landscape: Flood plains
Slope range: 0 to 2 percent

Composition

Percent of survey area: 7 percent
Extent of components in the association:
Caneek soils—60 percent
Minor soils—40 percent

Soil Properties and Qualities

Caneek
Drainage class: Poorly drained

Landscape: Flood plains
Landform: Flood plains
Slope: 0 to 2 percent
Parent material: Alluvium

Minor Soils

• Orion and similar soils

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification. The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

Formation of the Soils

Soil forms through processes acting on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material (Jenny, 1941). Human activities also affect soil formation.

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of parent material into a soil. A long period generally is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the others.

Climate

The soils in Allamakee County probably formed under the influence of a midcontinental subhumid climate for at least 7,000 years. Between 7,000 and 16,000 years ago, the climate favored the growth of forest vegetation (Ruhe, 1956; Walker, 1966). The morphology of most of the soils in the county indicates that the climate under which they formed is similar to the present one. The climate generally is uniform throughout the county but is marked by wide seasonal extremes in temperature. Precipitation is distributed throughout the year.

Climate is a major factor in determining what soils form in the various parent materials. It affects the rate and intensity of hydrolysis, carbonation, oxidation, and other important chemical reactions in the soil. Temperature, rainfall, relative humidity, and length of the frost-free period affect the kind of vegetation on the soil.

Local conditions somewhat modify the effect of the general climate of a region on soil formation. For example, the microclimate on south-facing slopes is warmer and less humid than that in nearby areas. Low lying, poorly drained areas are wetter and colder than most of the areas around them.

Living Organisms

Plants and animals have an important effect on soil formation. Plant life is especially significant because it helps to initiate soil formation. As they grow and die, plants add organic matter to the upper layers of the soil. The native grasses, which have numerous fibrous roots that extend to a depth of 10 to 20 inches, add large amounts of organic matter to the surface layer. Trees commonly feed on plant nutrients deep in the subsoil. As a result, they add little organic matter to the surface layer other than that added by fallen leaves and dead branches or trunks. Much of the organic matter from dead trees remains on the surface or is lost through decomposition.

Muscatine and Tama soils are typical of soils that formed under prairie grasses. Dubuque, Fayette, and Village soils are typical of soils that formed under trees. Downs, Frankville, and Allamakee soils have properties intermediate between those of soils that formed entirely under prairie grasses and those of soils that formed entirely under trees. Soils that formed under trees have a dark surface layer that generally is less than 5 inches thick. They have a lighter colored E horizon directly

below the surface layer. In contrast, soils that formed under prairie grasses contain a large amount of organic matter derived from roots and have a thick dark surface layer.

Tama, Downs, and Fayette soils are members of a biosequence, or a group of soils that formed in the same parent material and under similar environmental conditions but supported different kinds of native vegetation. Tama soils formed under prairie grasses, Downs soils under mixed grasses and trees, and Fayette soils under trees. The main morphological differences among the three soils result from the different kinds of native vegetation.

The activities of burrowing animals and insects tend to loosen and aerate the upper few feet of the soil.

Parent Material

The accumulation of parent material is the first step in the formation of a soil. Some thin layers of several soils in the county formed as a result of the weathering of bedrock. Most of the soils, however, formed in material that was transported from the site of the parent rock and deposited at a new location through the action of glacial ice, water, wind, and gravity.

The principal parent materials in the county are loess, alluvium, residuum, colluvium, and erosional sediments. Much less extensive are lacustrine deposits and eolian sand.

Loess, a silty material deposited by the wind, covers about 85 percent of the county. It ranges in depth from about 5 to 15 feet on the more stable ridges to a thin mantle of less than 5 feet on the side slopes. It overlies limestone bedrock or clayey pedisediment. The base of the Wisconsin-age loess in Iowa is 16,550 to 29,000 years old (Ruhe, 1969). Loess consists mostly of silt and some clay. It does not contain coarse sand or gravel, which were too large to be moved by the wind, but it does contain small amounts of fine sand and very fine sand, generally less than 5 percent.

Downs, Fayette, and Tama soils formed in a layer of loess more than 60 inches thick. Dubuque and Frankville soils formed in a layer of loess less than 40 inches thick over limestone. Nordness soils formed in a very thin layer of loess underlain by bedrock. Village and Allamakee soils formed in a layer of loess less than 40 inches thick over clayey pedisediment. Paintcreek soils formed in a very thin layer of loess underlain by clayey pedisediment.

Alluvium is material that has been deposited by rivers and streams. Alluvial deposits of Late Wisconsin age are on the flood plains and terraces in the county. The major areas where the soils formed in alluvium are along the Upper Iowa, Yellow, and Mississippi Rivers and their tributaries. Large flood plains are along the Mississippi and Upper Iowa Rivers.

Much of the alluvium in the county washed from loess-covered slopes in the uplands. The alluvial sediments commonly are silty and low in content of sand. Arenzville, Chaseburg, Elon, Huntsville, Ion, and Otter soils formed in silty alluvium. Spillville soils formed in loamy alluvium. They contain more sand than the silty soils.

Textural differences among the alluvial soils are accompanied by some variations in the chemical and mineralogical composition of the soils. Some soils formed in recently deposited, calcareous alluvium. Examples are Caneek, Ion, and Volney soils. The other alluvial soils on flood plains are free of carbonates and are neutral to medium acid.

Some alluvial material on foot slopes has been transported only short distances. This local alluvium retains many characteristics of the soils on the slopes from which it has eroded. Worthen soils, which are on alluvial fans and foot slopes directly below loess-covered slopes, formed in this material.

The soils on terraces also formed in alluvium. They are above the flood plain and generally are not subject to flooding. Most are underlain by coarser textured material within a depth of 4 to 6 feet. The texture of these soils varies. Bertrand and Festina soils formed in silty alluvium, whereas Sattre and Waukee soils formed in loamy alluvium overlying coarse sand and gravel.

Colluvium is soil material, rock fragments, or both moved by creep, slide, or local wash and deposited lower on the slopes. Colluvial deposits are on the steep and very steep side slopes along the major rivers and their tributaries in the county.

Much of the colluvium in the county is derived from physical weathering, the freezing and thawing of the bedrock, and movement by gravity. The colluvial sediments are silty or loamy. Lacrescent soils formed in colluvial sediments.

Erosional sediments are materials that have been reworked and moved mainly by water. The erosional sediments in the county are derived from residuum, glacial till, and bedrock fragments.

A deposit of loess overlies the erosional sediments in Allamakee County. Village and Allamakee soils formed in 20 to 40 inches of loess over the clayey erosional sediments. Paintcreek soils formed in less than 20 inches of loess over the clayey erosional sediments.

Residuum is material weathered in place from sedimentary rocks. Limestone, sandstone, and shale are the types of sedimentary rocks in Allamakee County. In most areas loess covers the residuum.

In Allamakee County the layer of residuum generally is less than 6 inches thick over bedrock. A deposit of

loess overlies a thin layer of residuum in Dubuque and Frankville soils.

The residuum commonly is silty clay or clay. Material weathered from limestone or sandstone commonly has a reddish hue, whereas material weathered from shale is more yellowish.

Eolian sand is not extensive in Allamakee County. It is deposited along the valleys of the major streams. These deposits are much higher in content of sand than the deposits of loess.

Wind-deposited sand is mainly fine and very fine quartz that is highly resistant to weathering. It has not been altered appreciably since it was deposited. Chelsea and Sparta soils formed mainly in wind-deposited loamy sand.

Lacustrine sediments are deposited in lake water. They are exposed when the water level in the lakes is lowered or the elevation of the land is raised. These sediments are not extensive in Allamakee County. They are only on high benches along tributaries of the Mississippi River. Slack-water material was deposited when the Mississippi River was blocked late in the glacial period. This material extends to about 3 miles from the river along some of its tributaries.

The lacustrine deposits in the county are clayey. The content of clay ranges from 40 to 80 percent. The deposits are 2 to 5 feet thick over silty alluvial sediments. Medary and Zwingle soils formed in these deposits.

Relief

Relief indirectly affects soil formation through its effect on drainage. In Allamakee County, relief ranges from nearly level to very steep. Many nearly level soils are frequently flooded and have a seasonal high water table. Water soaks into nearly level soils that are not flooded. Much of the rainfall runs off the surface of the more sloping soils, and less penetrates the surface. The steeper Nordness soils are examples. They show very little evidence of soil formation.

The color of the subsoil is affected by natural drainage. The subsoil is dominantly olive gray, for example, in the poorly drained Otter soils. It is dominantly yellowish brown in the well drained Bertrand, Downs, Fayette, Festina, and Tama soils, which have a seasonal high water table below a depth of 6 feet. The subsoil tends to be grayish brown and mottled in the somewhat poorly drained Atterberry, Muscatine, and Rowley soils. Of the soils that formed under prairie grasses, those that have a seasonal high water table generally contain more organic matter in the surface layer than those that are well drained.

Some of the properties of Downs, Fayette, Village, and other soils that have a wide slope range vary according to the slope. Examples of these properties are the depth to carbonates and the thickness of the surface layer. Carbonates are closer to the surface in areas where slopes are steepest. Also, the surface layer is thinner in these areas. Other properties that vary according to the slope are the maximum percent of clay in the B horizon and the depth to the layer that has the highest content of clay. Both of these properties decrease with increasing slope.

Slope aspect, topographic position, and slope gradient have significant effects on soil formation. Soils on south-facing slopes, for example, generally are warmer and drier than soils on north-facing slopes and consequently support a different kind and amount of vegetation. The nearly level Richwood, Rowley, and Otter soils formed in the same kind of parent material and under similar vegetation but differ because of slight differences in topographic position. Their microrelief affects runoff and the depth to the seasonal high water table. The poorly drained Otter soils are at low elevations on flood plains. They have a seasonal high water table, and water is impounded in areas of these soils for short periods. The somewhat poorly drained Rowley soils are at the slightly higher elevations on stream terraces, and the well drained Richwood soils are at the higher elevations. Worthen soils are on foot slopes and in upland waterways. They have properties related to the upslope soils from which they receive sediments.

The influence of porous, rapidly permeable parent material may override the influence of topography. Although they are only gently sloping, Hawick soils are excessively drained because they have a very rapidly permeable subsoil.

Time

Time is needed for the various processes of soil formation to take effect. The amount of time needed ranges from a few years for the formation of a thin A horizon in fresh alluvial deposits, such as the A horizon in Caneek silt loam, channeled, to a thousand years or more for the formation of a subsoil in many of the older upland soils. The older soils have well defined genetic horizons. Downs and Fayette soils are examples. The younger soils have only weakly expressed horizons. Some of the soils that formed in alluvium, for example, show little or no evidence of profile development because fresh material is deposited periodically. The material has not been in place long enough for the climate and vegetation to influence the formation of well defined genetic horizons.

If other factors are favorable, the texture of the subsoil generally becomes finer and a greater amount of soluble material is leached out as the soils continue

to weather. Exceptions are soils that formed in quartz sand, such as Sparta soils, or in other material that is resistant to weathering. These soils do not change much over a long period. Other exceptions are the steep Nordness soils. These soils form more slowly than the less sloping soils in stable areas because only a small amount of water penetrates the surface and a large amount runs off.

In areas where ice, water, or wind has buried organic material under soil material, the age of a landscape can be determined through radiocarbon dating (Ruhe and others, 1955). Radiocarbon dates indicate that the loess in which Downs, Fayette, and Tama soils formed is probably about 14,000 to 20,000 years old.

Human Activities

Important changes took place when Allamakee County was settled. Some of these changes had little effect on soil productivity, but others had a drastic impact.

Breaking the prairie sod and clearing the timber removed or changed the protective plant cover. Cultivation increases the susceptibility of the more sloping soils to erosion, which removes topsoil, organic matter, and plant nutrients. Sheet erosion, the most prevalent kind of erosion in the county, removes a few inches of topsoil at one time. Cultivation generally destroys all evidence of this loss. In some areas, shallow and deep gullies have formed and the eroded soil material has been deposited on the lower slopes. As the land was brought under cultivation, the runoff rate increased and the rate at which water moved into the soil decreased. As a result, accelerated erosion removed part or all of the original surface layer from many of the more sloping soils.

Cultivation and erosion changed the structure and consistence of the surface layer of some soils and the content of organic matter and level of fertility. In severely eroded areas the plow layer commonly includes the upper part of the subsoil, which is less friable and finer textured than the surface layer. Even in areas that are not subject to erosion, compaction by heavy machinery reduces the thickness of the surface layer and changes the soil structure. The granular structure characteristic of native grassland breaks down when the soils are intensively cropped. The surface layer of these soils generally is hard when dry. Fine textured soils that have been plowed many times during wet periods tend to puddle and are more slowly permeable than similar soils in uncultivated areas.

Eroded soil material from hillsides commonly is deposited in the lower lying areas. For example, Arenzville, Caneek, and Ion soils, which formed in recent alluvium, have strata of light and dark colored soil material washed from the hillsides and deposited by floodwater.

Some management measures decrease the susceptibility to erosion, increase soil productivity, and reclaim areas not suitable for crops or pasture. For example, large areas on bottom land are suitable for cultivation because flooding and deposition are controlled by diversions at the base of slopes, by drainage ditches, and by other measures. Many soils are more productive than they were naturally because applications of commercial fertilizer and lime have overcome deficiencies in plant nutrients. In some areas erosion and runoff are controlled by terraces and other measures.

Erosion is the main cause of a decrease in the content of organic matter in soils (Smith and others, 1950). Although they cannot increase the organic matter content to the level that was characteristic of native grassland, measures that control erosion can keep the content at a level that is needed when crops are grown.

Processes of Soil Formation

Horizon differentiation is the result of four basic processes. These are additions, removals, transfers, and transformations (Simonson, 1959). Each of these affects many substances in the soil, such as organic matter, soluble salts, carbonates, sesquioxides, and silicate clay minerals. The changes brought about by these processes help to determine the ultimate nature of the soil profile.

The accumulation of organic matter is an early phase in the formation of most soils. The content of organic matter ranges from very high to very low in the A horizon of the soils in Allamakee County. It is low in the thin A horizon of Fayette soils and high in the thick A horizon of Garwin soils. In some soils it is low because erosion has removed part of the A horizon.

The removal of substances from parts of the profile has differentiated horizons in most of the soils in the county. The downward movement of calcium carbonate and bases is an example. Free carbonates have been leached from the upper part of nearly all of the soils. Exceptions are Caneek, Elon, and Ion soils. Some soils are so strongly leached that they are strongly acid or very strongly acid in the subsoil.

A number of substances are transferred from one horizon to another. Phosphorus, for example, is removed from the subsoil by plant roots and transferred to the parts of the plant growing above the ground. It is then added to the surface layer in the plant residue. This process affects the form and distribution of the phosphorus in the profile.

The translocation of silicate clay minerals has an

important effect on horizon differentiation. The clay minerals are carried downward in suspension by percolating water from the A horizon. They accumulate in the B horizon as fillings in pores and root channels and as clay films on the faces of peds. This process has affected many of the soils in the county. In other soils, the clay content of the A horizon is not markedly different from that of the B horizon and other evidence of clay movement is minimal.

Another kind of transfer occurs only in the very clayey soils. Cracks form when these soils shrink and swell. As a result, some of the material from the surface layer is transferred to the lower parts of the profile. This kind of transfer can occur in Medary and Zwingle soils.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes is an example of transformation. The reduction of iron is another example. This process is called gleying. It occurs when the soil is saturated for long periods. It is evidenced by ferrous iron and gray colors in the soil. It is a characteristic of poorly drained soils, such as Otter soils. Reductive extractable iron, or free iron, generally is not so evident in somewhat poorly drained soils, such as Rowley soils.

Another kind of transformation is the weathering of the primary apatite mineral in the parent material to secondary phosphorus compounds. This process occurs in Otter and other soils that have a pH near 7. The supply of available phosphorus is higher in these soils than in Ion and other soils that have a pH of more than 7.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu,* meaning water, plus *oll,* from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquolls (*Endo,* meaning within, plus *aquoll,* the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Endoaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Endoaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allamakee	Mollic Hapludalfs, fine-silty over clayey, mixed, mesic
Arenzville	Typic Udifluvents, coarse-silty, mixed, nonacid, mesic
Atterberry	Udollic Endoaqualfs, fine-silty, mixed, mesic
Bertrand	Typic Hapludalfs, fine-silty, mixed, mesic
Boone	Typic Quartzipsamments, mesic, uncoated
Caneek	Aeric Fluvaquents, fine-silty, mixed (calcareous), mesic
Chaseburg	Typic Udifluvents, coarse-silty, mixed, nonacid, mesic
Chelsea	Argic Udipsamments, mixed, mesic
Churchtown	Mollic Hapludalfs, fine-silty, mixed, mesic
Downs	Mollic Hapludalfs, fine-silty, mixed, mesic
Dubuque	Typic Hapludalfs, fine-silty, mixed, mesic
Eitzen	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Elon	Aquic Udifluvents, coarse-silty, mixed (calcareous), mesic
Fayette	Typic Hapludalfs, fine-silty, mixed, mesic
Festina	Mollic Hapludalfs, fine-silty, mixed, mesic
Frankville	Mollic Hapludalfs, fine-silty, mixed, mesic
Garwin	Typic Haplaquolls, fine-silty, mixed, mesic
Hawick	Entic Hapludolls, sandy, mixed, mesic
Huntsville	Cumulic Hapludolls, fine-silty, mixed, mesic
Ion	Mollic Udiflufents, coarse-silty, mixed (calcareous), mesic
Lacrescent	Typic Hapludolls, loamy-skeletal, mixed, mesic
Lawson	Cumulic Hapludolls, fine-silty, mixed, mesic
Lycurgus	Typic Argiudolls, fine-silty, mixed, mesic
Massbach	Mollic Hapludalfs, fine-silty, mixed, mesic
Medary	Typic Hapludalfs, fine, mixed, mesic
Muscatine	Aquic Hapludolls, fine-silty, mixed, mesic
Nordness	Lithic Hapludalfs, loamy, mixed, mesic
Orion	Aquic Udifluvents, coarse-silty, mixed, nonacid, mesic
Otter	Cumulic Endoaquolls, fine-silty, mixed, mesic
Paintcreek	Typic Hapludalfs, fine, mixed, mesic
Richwood	Typic Argiudolls, fine-silty, mixed, mesic
Rowley	Aquic Argiudolls, fine-silty, mixed, mesic
Sattre	Mollic Hapludalfs, fine-loamy over sandy or sandy-skeletal, mixed, mesic
Shullsburg	Aquic Argiudolls, fine, mixed, mesic
Sparta	Entic Hapludolls, sandy, mixed, mesic
Spillville	Cumulic Hapludolls, fine-loamy, mixed, mesic
Tama	Typic Argiudolls, fine-silty, mixed, mesic
Village	Typic Hapludalfs, fine-silty over clayey, mixed, mesic
Volney	Cumulic Hapludolls, loamy-skeletal, mixed, mesic
Waukee	Typic Hapludolls, fine-loamy over sandy or sandy-skeletal, mixed, mesic
Worthen	Cumulic Hapludolls, fine-silty, mixed, mesic
Yellowriver	Typic Hapludalfs, fine-silty, mixed, mesic
Zwingle	Typic Albaqualfs, fine, montmorillonitic, mesic

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
40D	Fayette silt loam, karst, 2 to 14 percent slopes	1,775	0.4
41B	Sparta sand, 2 to 5 percent slopes	210	*
41C	Sparta sand, 5 to 9 percent slopes	220	*
41D	Sparta sand, 9 to 14 percent slopes	310	*
63B	Chelsea loamy sand, 2 to 5 percent slopes	170	*
63C	Chelsea loamy sand, 5 to 9 percent slopes	400	*
63D	Chelsea loamy sand, 9 to 14 percent slopes	395	*
63E	Chelsea loamy sand, 14 to 18 percent slopes	600	0.1
63F	Chelsea loamy sand, 18 to 25 percent slopes	260	*
63G	Chelsea loamy sand, 25 to 45 percent slopes	1,275	0.3
85	Eitzen silt loam, 0 to 2 percent slopes	5,500	1.3
85B	Eitzen silt loam, 2 to 5 percent slopes	3,980	0.9
98	Huntsville silt loam, 0 to 2 percent slopes	1,045	0.2
98B	Huntsville silt loam, 2 to 5 percent slopes	240	*
118	Garwin silty clay loam, 0 to 2 percent slopes	135	*
119B	Muscatine silt loam, 1 to 4 percent slopes	880	0.2
120B	Tama silt loam, 2 to 5 percent slopes	2,370	0.6
120C	Tama silt loam, 5 to 9 percent slopes	325	*
129B	Arenzville-Chaseburg complex, 1 to 5 percent slopes	1,810	0.4
140B	Sparta loamy sand, 2 to 5 percent slopes	845	0.2
140C	Sparta loamy sand, 5 to 9 percent slopes	270	*
142	Chaseburg silt loam, 0 to 2 percent slopes	585	0.1
162B	Downs silt loam, 2 to 5 percent slopes	15,350	3.6
162B2	Downs silt loam, 2 to 5 percent slopes, moderately eroded	3,150	0.7
162C	Downs silt loam, 5 to 9 percent slopes	8,720	2.1
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded	20,995	5.0
162D	Downs silt loam, 9 to 14 percent slopes	1,525	0.4
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded	8,465	2.0
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded	320	*
163B	Fayette silt loam, 2 to 5 percent slopes	4,175	1.0
163B2	Fayette silt loam, 2 to 5 percent slopes, moderately eroded	1,120	0.3
163C	Fayette silt loam, 5 to 9 percent slopes	2,665	0.6
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	38,390	9.1
163D	Fayette silt loam, 9 to 14 percent slopes	4,525	1.1
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded	41,760	9.9
163E	Fayette silt loam, 14 to 18 percent slopes	3,505	0.8
163E2	Fayette silt loam, 14 to 18 percent slopes, moderately eroded	7,225	1.7
163F	Fayette silt loam, 18 to 25 percent slopes	1,245	0.3
163G	Fayette silt loam, 25 to 40 percent slopes	300	*
178B	Waukee loam, 1 to 5 percent slopes	420	*
196B	Volney channery loam, 2 to 5 percent slopes	1,050	0.2
196C	Volney channery loam, 5 to 9 percent slopes	400	*
206C	Shullsburg silty clay loam, 3 to 9 percent slopes	255	*
210E	Boone loamy sand, 9 to 18 percent slopes	400	*
210F	Boone loamy sand, 18 to 25 percent slopes	595	0.1
210G	Boone loamy sand, 25 to 40 percent slopes	3,325	0.8
249C	Zwingle silt loam, 1 to 9 percent slopes	455	0.1
291	Atterberry silt loam, 1 to 3 percent slopes	270	*
320	Arenzville silt loam, 0 to 2 percent slopes	1,215	0.3
478G	Nordness-Rock outcrop complex, 25 to 60 percent slopes	1,185	0.3
484	Lawson silt loam, 0 to 2 percent slopes	1,570	0.4
485	Spillville loam, 0 to 2 percent slopes	400	*
487B	Otter-Worthen complex, 1 to 4 percent slopes	1,495	0.4
490	Caneek silt loam, 0 to 2 percent slopes	835	0.2
499C	Nordness silt loam, 5 to 9 percent slopes	425	0.1
499D	Nordness silt loam, 9 to 14 percent slopes	910	0.2
499D2	Nordness silt loam, 9 to 14 percent slopes, moderately eroded	710	0.2
499E	Nordness silt loam, 14 to 18 percent slopes	2,855	0.7
499E2	Nordness silt loam, 14 to 18 percent slopes, moderately eroded	695	0.2
499F	Nordness silt loam, 18 to 25 percent slopes	4,650	1.1
499G	Nordness silt loam, 25 to 40 percent slopes	9,435	2.2

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
589	Otter silt loam, 0 to 2 percent slopes	305	*
703C	Dubuque silt loam, 5 to 9 percent slopes	260	*
703C2	Dubuque silt loam, 5 to 9 percent slopes, moderately eroded	805	0.2
703D	Dubuque silt loam, 9 to 14 percent slopes	2,005	0.5
703D2	Dubuque silt loam, 9 to 14 percent slopes, moderately eroded	5,890	1.4
703E	Dubuque silt loam, 14 to 18 percent slopes	3,045	0.7
703E2	Dubuque silt loam, 14 to 18 percent slopes, moderately eroded	3,230	0.8
703F	Dubuque silt loam, 18 to 25 percent slopes	1,120	0.3
721C	Massbach silt loam, 3 to 9 percent slopes	420	*
721D	Massbach silt loam, 9 to 15 percent slopes,	260	*
740C	Hawick gravelly sand, 2 to 9 percent slopes	240	*
740G	Hawick gravelly sand, 18 to 40 percent slopes	375	*
778B	Sattre loam, 1 to 5 percent slopes	230	*
793B	Bertrand silt loam, 2 to 5 percent slopes	360	*
793C	Bertrand silt loam, 5 to 9 percent slopes	410	*
793D2	Bertrand silt loam, 9 to 14 percent slopes, moderately eroded	170	*
793E	Bertrand silt loam, 14 to 18 percent slopes	180	*
826	Rowley silt loam, 0 to 2 percent slopes	210	*
837C	Village silt loam, 5 to 9 percent slopes	310	*
837C2	Village silt loam, 5 to 9 percent slopes, moderately eroded	890	0.2
837D	Village silt loam, 9 to 14 percent slopes	3,055	0.7
837D2	Village silt loam, 9 to 14 percent slopes, moderately eroded	11,060	2.6
837E	Village silt loam, 14 to 18 percent slopes	6,805	1.6
837E2	Village silt loam, 14 to 18 percent slopes, moderately eroded	6,200	1.5
837F	Village silt loam, 18 to 25 percent slopes	3,150	0.7
838C2	Allamakee silt loam, 5 to 9 percent slopes, moderately eroded	230	*
838D	Allamakee silt loam, 9 to 14 percent slopes	285	*
838D2	Allamakee silt loam, 9 to 14 percent slopes, moderately eroded	1,585	0.4
838E2	Allamakee silt loam, 14 to 18 percent slopes, moderately eroded	390	*
840E	Lacrescent silt loam, 14 to 18 percent slopes	230	*
840F	Lacrescent silt loam, 18 to 25 percent slopes	705	0.2
840G	Lacrescent silt loam, 25 to 70 percent slopes	54,725	13.0
841G	Rock outcrop-Boone complex, 20 to 70 percent slopes	2,975	0.7
843	Elon silt loam, 0 to 2 percent slopes	1,735	0.4
861D	Yellowriver silt loam, 9 to 14 percent slopes	150	*
861D2	Yellowriver silt loam, 9 to 14 percent slopes, moderately eroded	180	*
861E	Yellowriver silt loam, 14 to 18 percent slopes	1,060	0.3
861E2	Yellowriver silt loam, 14 to 18 percent slopes, moderately eroded	335	*
861F	Yellowriver silt loam, 18 to 25 percent slopes	1,575	0.4
861G	Yellowriver silt loam, 25 to 40 percent slopes	840	0.2
862D	Churchtown loam, 9 to 14 percent slopes	330	*
862D2	Churchtown loam, 9 to 14 percent slopes, moderately eroded	385	*
862E	Churchtown loam, 14 to 18 percent slopes	1,945	0.5
862E2	Churchtown loam, 14 to 18 percent slopes, moderately eroded	680	0.2
862F	Churchtown loam, 18 to 25 percent slopes	865	0.2
903C2	Frankville silt loam, 5 to 9 percent slopes, moderately eroded	355	*
903D	Frankville silt loam, 9 to 14 percent slopes	200	*
903D2	Frankville silt loam, 9 to 14 percent slopes, moderately eroded	600	0.1
903E2	Frankville silt loam, 14 to 18 percent slopes, moderately eroded	365	*
912C	Paintcreek silt loam, 5 to 9 percent slopes	200	*
912D	Paintcreek silt loam, 9 to 14 percent slopes	1,705	0.4
912D2	Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded	1,645	0.4
912E	Paintcreek silt loam, 14 to 18 percent slopes	6,015	1.4
912E2	Paintcreek silt loam, 14 to 18 percent slopes, moderately eroded	2,090	0.5
912F	Paintcreek silt loam, 18 to 30 percent slopes	19,680	4.7
930	Orion silt loam, 0 to 2 percent slopes	1,405	0.3
951G	Medary silt loam, 14 to 45 percent slopes	520	0.1
977	Richwood silt loam, 0 to 2 percent slopes	235	*
977B	Richwood silt loam, 2 to 5 percent slopes	235	*
978B	Festina silt loam, 2 to 5 percent slopes	575	0.1
978C	Festina silt loam, 5 to 9 percent slopes	230	*

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
981B	Worthen silt loam, 2 to 7 percent slopes	1,085	0.3
1120D	Lycurgus silt loam, 9 to 14 percent slopes	150	*
1120E	Lycurgus silt loam, 14 to 18 percent slopes	325	*
1120F	Lycurgus silt loam, 18 to 25 percent slopes	165	*
1490	Caneek silt loam, channeled, 0 to 2 percent slopes	10,855	2.6
1496	Arenzville-Volney complex, 0 to 2 percent slopes	1,885	0.4
1496B	Arenzville-Volney complex, 2 to 5 percent slopes	3,880	0.9
1793G	Bertrand-Chelsea complex, 18 to 35 percent slopes	865	0.2
2670	Ion silt loam, 0 to 2 percent slopes	6,560	1.6
5010	Pits, sand and gravel	40	*
5030	Pits, limestone quarries	235	*
5040	Orthents, loamy	425	0.1
	Water	16,900	4.0
	Total	422,200	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed maps in Part III of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are described in Part II of this survey.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the

basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Fayette silt loam, 5 to 9 percent slopes, is a phase of the Fayette series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Arenzville-Volney complex, 2 to 5 percent slopes, is an example.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits, sand and gravel, is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of this survey gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Allamakee Series

Drainage class: Well drained
Permeability: Moderate in the upper part, slow in the lower part
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Parent material: Loess over residuum
Native vegetation: Prairie grasses and open forest
Slope range: 5 to 18 percent

Typical Pedon

Allamakee silt loam, 9 to 14 percent slopes, in a pasture, 1,400 feet west and 750 feet north of the southeast corner of sec. 21, T. 99 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 18 minutes, and 33 seconds N. and longitude 43 degrees, 22 minutes, and 21 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few (5 percent) brown (10YR 4/3) streaks and pockets; weak fine and very fine subangular blocky structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.

BE—7 to 9 inches; brown (10YR 4/3) silt loam; weak thin and thick platy structure parting to weak fine and very fine subangular blocky; friable; few very fine roots; slightly acid; clear smooth boundary.

Bt1—9 to 16 inches; dark brown (7.5YR 4/4) silt loam; weak medium and fine subangular blocky structure; friable; few very fine roots; slightly acid; gradual smooth boundary.

Bt2—16 to 23 inches; strong brown (7.5YR 4/6) silty clay loam; moderate fine subangular blocky structure; friable; few very fine roots; medium acid; clear smooth boundary.

2Bt3—23 to 27 inches; dark yellowish brown (10YR 4/4) and dark brown (7.5YR 4/4) clay loam; moderate fine and medium subangular blocky structure; friable; few very fine roots; common black (10YR 2/1) organic stains on faces of peds; about 5 percent coarse fragments ½ to 1 inch in diameter; strongly acid; abrupt wavy boundary.

2Bt4—27 to 32 inches; yellowish red (5YR 4/6) clay; moderate medium and fine subangular blocky structure; firm; few very fine roots; common black (10YR 2/1) organic stains on faces of peds; about 10 percent coarse fragments ½ to 1 inch in diameter; very strongly acid; gradual wavy boundary.

2Bt5—32 to 48 inches; yellowish red (5YR 4/6) cobbly clay; moderate medium and fine subangular blocky and angular blocky structure; firm; common black (10YR 2/1) organic stains on faces of peds; 30 to 35 percent coarse chert and sandstone fragments 1 to 8 inches in diameter; very strongly acid; clear wavy boundary.

2BC—48 to 60 inches; yellowish red (5YR 4/6) and dark yellowish brown (10YR 4/4 and 4/6), stratified sandy loam, loam, sandy clay loam, sandy clay, and clay; weak medium and fine subangular blocky structure; friable; few black (10YR 2/1) organic stains on faces of peds; 10 to 20 percent coarse sandstone fragments 1 to 6 inches in diameter; very strongly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the loess: 20 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—4 to 6
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—3 to 7
Chroma—3 to 8
Texture—clay loam or clay

2BC horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—stratified sandy loam, loam, sandy clay loam, sandy clay, clay loam, and clay

838C2—Allamakee silt loam, 5 to 9 percent slopes, moderately eroded

Composition

Allamakee and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

838D—Allamakee silt loam, 9 to 14 percent slopes

Composition

Allamakee and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

838D2—Allamakee silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Allamakee and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

838E2—Allamakee silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Allamakee and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Paintcreek and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Arenzville Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Flood plains and uplands
Landform: Flood plains and drainageways
Parent material: Local alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 5 percent

Typical Pedon

Arenzville silt loam, 0 to 2 percent slopes, in a pasture, 875 feet east and 1,180 feet south of the northwest corner of sec. 29, T. 99 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 28 minutes, and 3 seconds N. and longitude 43 degrees, 22 minutes, and 4 seconds W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) silt loam, light grayish brown (10YR 6/2) and grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

C—9 to 23 inches; stratified dark grayish brown (10YR 4/2) and brown (10YR 5/3) silt loam; thin strata of very dark grayish brown (10YR 3/2); massive with horizontal cleavage resulting from stratification;

friable; few fine roots; neutral; abrupt smooth boundary.

Ab1—23 to 47 inches; black (10YR 2/1) silt loam; weak fine subangular blocky structure; friable; few fine roots; neutral; gradual smooth boundary.

Ab2—47 to 60 inches; very dark grayish brown (10YR 3/2) silt loam; common fine distinct dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; friable; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Depth to Ab horizon: 20 to 40 inches

A or Ap horizon:
Hue—10YR
Value—3 to 5
Chroma—1 or 2
Texture—silt loam

C horizon:
Hue—10YR
Value—4 or 5 (dominantly)
Chroma—2 or 3 (dominantly)
Texture—silt loam

Ab horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam

129B—Arenzville-Chaseburg complex, 1 to 5 percent slopes

Composition

Arenzville and similar soils: About 50 percent
Chaseburg and similar soils: About 45 percent
Inclusions: About 5 percent

Setting

Landform: Drainageways
Slope: 1 to 5 percent

Component Description

Arenzville
Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

Chaseburg
Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Volney and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

320—Arenzville silt loam, 0 to 2 percent slopes

Composition

Arenzville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Local alluvium
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Areas that have limestone flags in buried soil

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

1496—Arenzville-Volney complex, 0 to 2 percent slopes

Composition

Arenzville and similar soils: About 45 percent
Volney and similar soils: About 25 percent
Inclusions: About 30 percent

Setting

Landform: Drainageways
Slope: 0 to 2 percent

Component Description

Arenzville
Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Alluvium
Flooding: Frequent
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

Volney
Surface layer texture: Channery loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Flooding: Frequent
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Lawson and similar soils
• Spillville and similar soils
• Huntsville and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

1496B—Arenzville-Volney complex, 2 to 5 percent slopes

Composition

Arenzville and similar soils: About 45 percent
Volney and similar soils: About 30 percent
Inclusions: About 25 percent

Setting

Landform: Drainageways
Slope: 2 to 5 percent

Component Description

Arenzville
Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Alluvium
Flooding: Frequent
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

Volney
Surface layer texture: Channery loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium

Flooding: Frequent
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Huntsville and similar soils
- Lawson and similar soils
- Spillville and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Atterberry Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Uplands
Landform: Interfluves
Geomorphic component: Summits
Parent material: Loess
Native vegetation: Deciduous trees and prairie grasses
Slope range: 1 to 3 percent

Typical Pedon

Atterberry silt loam, 1 to 3 percent slopes, in a cultivated field, 850 feet west and 2,300 feet north of the southeast corner of sec. 30, T. 97 N., R. 4 W.; U.S.G.S. Waterville, Iowa, Topographic Quadrangle; latitude 91 degrees, 21 minutes, and 8 seconds N. and longitude 43 degrees, 11 minutes, and 20 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine and few fine roots; neutral; abrupt smooth boundary.

E—9 to 17 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam; few discontinuous dark gray (10YR 4/1) coatings on faces of peds; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate thin platy structure; friable; few patchy gray or light gray (10YR 6/1) and light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; few very fine roots; neutral; clear smooth boundary.

EB—17 to 25 inches; grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak thin platy structure parting to weak very fine subangular blocky; friable; patchy gray or light gray (10YR 6/1) silt coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Btg1—25 to 34 inches; dark brown or brown (10YR 4/3) silt loam; few fine distinct grayish brown (10YR 5/2) and common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium and fine subangular blocky structure; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; patchy gray or light gray (10YR 6/1) silt coatings on faces of peds; few fine and few very fine roots; few dark concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

Btg2—34 to 43 inches; dark brown or brown (10YR 4/3) silty clay loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few very fine and few fine roots; few dark concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

BC—43 to 51 inches; dark brown or brown (10YR 4/3) silty clay loam; few fine distinct grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few very fine roots; common dark concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

C—51 to 60 inches; dark brown or brown (10YR 4/3) silt loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; friable; few very fine roots; common dark concretions (iron and manganese oxides); strongly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—1 or 2
Texture—silt loam

Btg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam

291—Atterberry silt loam, 1 to 3 percent slopes

Composition

Atterberry and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Interfluves
Position on landform: Summits of hills
Slope: 1 to 3 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 1 to 3 feet
Available water capacity to 60 inches or root-limiting layer: About 13.4 inches (high)
Organic matter content in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Muscatine and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Bertrand Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads and risers
Parent material: Silty alluvium over sand and gravel
Native vegetation: Deciduous trees
Slope range: 2 to 35 percent

Typical Pedon

Bertrand silt loam, 2 to 5 percent slopes, in a cultivated field, 570 feet north and 1,280 feet west of the southeast corner of sec. 27, T. 100 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 24 minutes, and 57 seconds N. and longitude 43 degrees, 26 minutes, and 38 seconds W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; about 5 percent dark yellowish brown (10YR 4/4) mixings; weak fine and medium subangular blocky structure; friable; few very fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few very fine roots; slightly acid; clear smooth boundary.

Bt2—16 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few small patches of silt coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Bt3—20 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium angular blocky structure; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; patchy silt

coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Bt4—27 to 32 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium prismatic structure parting to moderate medium and fine angular blocky; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; patchy silt coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Bt5—32 to 39 inches; dark yellowish brown (10YR 4/4) silt loam; few medium prominent strong brown (7.5YR 5/6) and few medium prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; patchy silt coatings on faces of peds; few very fine roots; medium acid; gradual smooth boundary.

BCt—39 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; few medium prominent yellowish red (5YR 4/6) and common fine prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; few patchy silt coatings on faces of peds; slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

Ap or A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—silt loam

793B—Bertrand silt loam, 2 to 5 percent slopes

Composition

Bertrand and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Terraces
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sand and gravel
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a darker surface layer
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

793C—Bertrand silt loam, 5 to 9 percent slopes

Composition

Bertrand and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Terraces
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sand and gravel

Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a darker surface layer
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

793D2—Bertrand silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Bertrand and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sand and gravel
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

793E—Bertrand silt loam, 14 to 18 percent slopes

Composition

Bertrand and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sand and gravel
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1793G—Bertrand-Chelsea complex, 18 to 35 percent slopes

Composition

Bertrand and similar soils: About 60 percent
Chelsea and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Terraces
Slope: 18 to 35 percent

Component Description

Bertrand

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Local alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

Chelsea

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Local alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches (low)
Organic matter content in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hawick and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Boone Series

Drainage class: Excessively drained
Permeability: Rapid in the upper part, moderate or moderately slow in the lower part
Landscape: Uplands
Landform: Hills and scarps
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Parent material: Sandy residuum over sandstone bedrock
Native vegetation: Deciduous trees
Slope range: 9 to 70 percent

Typical Pedon

Boone loamy sand, 25 to 40 percent slopes, in a wooded area, 1,200 feet east and 2,590 feet north of the southwest corner of sec. 22, T. 100 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 32 minutes, and 47 seconds N. and longitude 43 degrees, 27 minutes, and 42 seconds W.

A1—0 to 4 inches; black (10YR 2/1) loamy sand, gray (10YR 5/1) dry; weak fine and medium subangular blocky structure parting to weak fine granular; very friable; many fine and very fine roots; neutral; clear smooth boundary.

A2—4 to 6 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; black (10YR 2/1) coatings on faces of peds; weak medium and fine subangular blocky structure; very friable; common very fine and fine roots; neutral; clear smooth boundary.

Bw1—6 to 10 inches; dark brown (10YR 4/3) loamy sand; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; very friable; few fine and very fine roots; neutral; clear smooth boundary.

Bw2—10 to 16 inches; dark brown (10YR 4/3) loamy sand; few very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; very friable; few very fine and fine roots; slightly acid; gradual smooth boundary.

C—16 to 24 inches; dark brown (10YR 4/3) sand; single grained; loose; few very fine roots; slightly acid; abrupt wavy boundary.

Cr—24 inches; sandstone bedrock.

Range in Characteristics

Depth to carbonates: Greater than 60 inches

Depth to paralithic contact: 20 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—loamy sand or sand

210E—Boone loamy sand, 9 to 18 percent slopes

Composition

Boone and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 9 to 18 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Sandstone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.0 inches (very low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a surface layer of loam

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

210F—Boone loamy sand, 18 to 25 percent slopes

Composition

Boone and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Sandstone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.0 inches (very low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a surface layer of loam

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

210G—Boone loamy sand, 25 to 40 percent slopes

Composition

Boone and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 25 to 40 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Sandstone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.0 inches (very low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sandstone bedrock outcrops

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Caneek Series

Drainage class: Poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform: Flood plains
Parent material: Alluvium
Native vegetation: Prairie grasses with scattered trees
Slope range: 0 to 2 percent

Typical Pedon

Caneek silt loam, channeled, 0 to 2 percent slopes, in a wooded area on bottom land, 1,200 feet north and 2,200 feet west of the southeast corner of sec. 7, T. 97 N., R. 2 W.; U.S.G.S. Eastman, Wisconsin, Topographic Quadrangle—Iowa; latitude 91 degrees, 7 minutes, and 11 seconds N. and longitude 43 degrees, 13 minutes, and 43 seconds W.

A—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few fine distinct dark brown (7.5YR 3/4) and few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; common medium and common fine roots; mildly alkaline; clear smooth boundary.

C1—9 to 19 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) and few fine distinct dark yellowish brown (10YR 4/6) mottles; massive with horizontal cleavage resulting from stratification; friable; few medium and few fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

C2—19 to 31 inches; stratified grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4 and 4/6) and dark brown (7.5YR 3/2) mottles; massive with horizontal cleavage resulting from stratification; friable; few fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

Ab1—31 to 49 inches; very dark gray (10YR 3/1) silt loam; common fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; gradual smooth boundary.

Ab2—49 to 60 inches; very dark gray (N 3/0) silt loam; few fine distinct strong brown (7.5YR 4/6) mottles; weak very fine and fine subangular blocky structure; friable; few fine roots; neutral.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to bedrock: Greater than 60 inches
Depth to Ab horizon: 20 to 40 inches

A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—silt loam

Ab horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silt loam or silty clay loam

490—Caneek silt loam, 0 to 2 percent slopes

Composition

Caneek and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Calcareous alluvium
Flooding: Frequent
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)
Organic matter content in the surface layer: About 1.2 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Arenzville and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

1490—Caneek silt loam, channeled, 0 to 2 percent slopes

Composition

Caneek and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Calcareous alluvium
Flooding: Frequent
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 13.2 inches (high)
Organic matter content in the surface layer: About 1.2 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have a surface layer of loamy sand or sandy loam

Major Uses of the Unit

• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

Chaseburg Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Flood plains and uplands
Landform: Flood plains and drainageways
Parent material: Alluvium
Native vegetation: Prairie grasses with scattered trees
Slope range: 0 to 5 percent

Typical Pedon

Chaseburg silt loam, 0 to 2 percent slopes, in a pasture, 380 feet east and 420 feet north of the southwest corner of sec. 19, T. 96 N., R. 5 W.; U.S.G.S. Monona, Iowa, Topographic Quadrangle; latitude 91 degrees, 29 minutes, and 13 seconds N. and longitude 43 degrees, 6 minutes, and 43 seconds W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; mildly alkaline; clear smooth boundary.

AC—7 to 18 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak thin platy structure parting to weak very fine subangular blocky; friable; few very fine roots; mildly alkaline; abrupt smooth boundary.

C1—18 to 31 inches; stratified grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2) silt loam; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

C2—31 to 43 inches; stratified dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), very dark

grayish brown (10YR 3/2), and very dark gray (10YR 3/1) silt loam; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; neutral; abrupt smooth boundary.

Ab—43 to 54 inches; very dark gray (10YR 3/1) silt loam; weak medium subangular blocky structure parting to weak fine granular; friable; neutral; clear smooth boundary.

ABb—54 to 60 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine subangular blocky structure; friable; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Depth to Ab horizon: Greater than 40 inches

Ap horizon:
Hue—10YR
Value—3 or 4
Chroma—2
Texture—silt loam

C horizon:
Hue—10YR
Value—3 to 5
Chroma—1 to 3
Texture—silt loam

Ab horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam

142—Chaseburg silt loam, 0 to 2 percent slopes

Composition

Chaseburg and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ion and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Chelsea Series

Drainage class: Excessively drained
Permeability: Rapid
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads and risers
Parent material: Eolian and alluvial sandy sediment
Native vegetation: Oak-hickory forest
Slope range: 2 to 45 percent

Typical Pedon

Chelsea loamy sand, 5 to 9 percent slopes, in a forested area, 2,160 feet east and 1,400 feet south of the northwest corner of sec. 26, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 17 minutes, and 0 seconds N. and longitude 43 degrees, 27 minutes, and 12 seconds W.

A1—0 to 1 inch; black (10YR 2/1) loamy sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; very strongly acid; many and common fine and very fine roots; clear smooth boundary.

A2—1 to 3 inches; very dark gray (10YR 3/1) loamy sand, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; very friable; common fine and very fine roots; very strongly acid; gradual smooth boundary.

E1—3 to 6 inches; dark grayish brown (10YR 4/2) loamy sand; weak medium subangular blocky structure; very friable; common fine and very fine roots; very strongly acid; gradual smooth boundary.

E2—6 to 11 inches; brown (10YR 4/3) loamy sand; weak medium and coarse subangular blocky structure; very friable; few fine and very fine roots;

very strongly acid; gradual smooth boundary.

E3—11 to 35 inches; yellowish brown (10YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; strongly acid; gradual smooth boundary.

E and Bt—35 to 60 inches; yellowish brown (10YR 5/6) sand; single grained; loose; few lamellae of strong brown (7.5YR 5/6) loamy sand ½ inch to 2 inches thick; strongly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand

Ap horizon (in cultivated areas):
Hue—10YR
Value—3 or 4
Chroma—2
Texture—loamy sand

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 6
Texture—loamy sand

E and Bt horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 to 6
Texture—sand or loamy sand

63B—Chelsea loamy sand, 2 to 5 percent slopes

Composition

Chelsea and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 2 to 5 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a thicker and darker surface layer

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

63C—Chelsea loamy sand, 5 to 9 percent slopes

Composition

Chelsea and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 5 to 9 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a thinner and lighter colored surface layer

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

63D—Chelsea loamy sand, 9 to 14 percent slopes

Composition

Chelsea and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 9 to 14 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a thinner and lighter colored surface layer

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

63E—Chelsea loamy sand, 14 to 18 percent slopes

Composition

Chelsea and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Terraces
Slope: 14 to 18 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a substratum of silt loam
- Areas of eroded soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

63F—Chelsea loamy sand, 18 to 25 percent slopes

Composition

Chelsea and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 18 to 25 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches

Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have a substratum of silt loam

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

63G—Chelsea loamy sand, 25 to 45 percent slopes

Composition

Chelsea and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 25 to 45 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have a substratum of silt loam

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

Churchtown Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills
Geomorphic component: Base slopes
Hillslope position: Foot slopes
Parent material: Slope alluvium
Native vegetation: Prairie grasses and deciduous trees
Slope range: 9 to 25 percent

Typical Pedon

Churchtown loam, 14 to 18 percent slopes, in a cultivated field, 2,000 feet east and 1,600 feet south of the northwest corner of sec. 2, T. 98 N., R. 6 W.; U.S.G.S. Hanover, Iowa, Topographic Quadrangle; latitude 91 degrees, 31 minutes, and 9 seconds N. and longitude 43 degrees, 20 minutes, and 15 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam (52 percent sand), grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 17 inches; brown (10YR 4/3) silt loam (22 percent sand); moderate fine subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; few thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine roots; neutral; gradual smooth boundary.

Bt2—17 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam (12 percent sand); moderate fine and medium subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) clay films on faces of peds; few thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few very fine roots; neutral; clear smooth boundary.

Bt3—24 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam (14 percent sand); weak medium prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous brown

(10YR 4/3) clay films on faces of peds; common thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; few very fine roots; neutral; clear smooth boundary.

2Bt4—30 to 44 inches; dark yellowish brown (10YR 4/4) silt loam (10 percent sand); weak medium prismatic structure; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; few thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; few very fine roots; neutral; gradual smooth boundary.

2Bt5—44 to 60 inches; yellowish brown (10YR 5/4) silt loam (10 percent sand); weak medium prismatic structure; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; very few thin discontinuous light gray (10YR 7/2) silt coatings on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of loamy sediments: 20 to 48 inches
Percent sand in loamy sediments: 10 to 55 percent

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam

E horizon (if it occurs):
Hue—10YR
Value—3 or 4
Chroma—2
Texture—loam or silt loam high in content of sand (20 to 40 percent)

Bt and 2Bt horizons:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam or silty clay loam

2C horizon (if it occurs):
Hue—10YR
Value—4 to 6
Chroma—4 to 6
Texture—silt loam

862D—Churchtown loam, 9 to 14 percent slopes

Composition

Churchtown and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

862D2—Churchtown loam, 9 to 14 percent slopes, moderately eroded

Composition

Churchtown and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

862E—Churchtown loam, 14 to 18 percent slopes

Composition

Churchtown and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Yellowriver and similar soils
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

862E2—Churchtown loam, 14 to 18 percent slopes, moderately eroded

Composition

Churchtown and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils
- Soils that have a surface layer of sandy loam
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

862F—Churchtown loam, 18 to 25 percent slopes

Composition

Churchtown and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Downs Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills
Geomorphic component: Divides, interfluves, side slopes, and head slopes
Hillslope position: Summits, shoulders, and back slopes
Parent material: Loess
Native vegetation: Mixed prairie grasses and trees
Slope range: 2 to 18 percent

Typical Pedon

Downs silt loam, 2 to 5 percent slopes, in a cultivated field, 2,620 feet north and 765 feet east of the southwest corner of sec. 7, T. 100 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 36 minutes, and 27 seconds N. and longitude 43 degrees, 29 minutes, and 36 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with few (less than 2 percent) pockets and streaks of brown (10YR 4/3) subsurface material; weak fine subangular blocky structure; friable; few very fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few dark organic stains on faces of peds; few very fine roots; neutral; clear smooth boundary.

Bt2—15 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and fine subangular and angular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few dark organic stains on faces of peds; few very fine roots; medium acid; gradual smooth boundary.

Bt3—29 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few dark organic stains on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Bt4—40 to 46 inches; yellowish brown (10YR 5/4) silty

clay loam; moderate coarse prismatic structure parting to weak medium and fine subangular blocky; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few very fine roots; medium acid; gradual smooth boundary.

BC—46 to 56 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse prismatic structure; friable; thin continuous brown (10YR 4/3) coatings on vertical faces of peds; few fine distinct strong brown (7.5YR 5/6) mottles; few very fine roots; few dark concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C—56 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; few very fine roots; few dark concretions (iron and manganese oxides); slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silty clay loam

C horizon:
Hue—10YR
Value—4 to 6
Chroma—3 to 6
Texture—silt loam

162B—Downs silt loam, 2 to 5 percent slopes

Composition

Downs and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have a thinner and lighter colored surface layer

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

162B2—Downs silt loam, 2 to 5 percent slopes, moderately eroded

Composition

Downs and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this

section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Tama and similar soils
- Fayette and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

162C—Downs silt loam, 5 to 9 percent slopes

Composition

Downs and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Allamakee and similar soils
- Frankville and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

162C2—Downs silt loam, 5 to 9 percent slopes, moderately eroded

Composition

Downs and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Allamakee and similar soils
- Frankville and similar soils
- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

162D—Downs silt loam, 9 to 14 percent slopes

Composition

Downs and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Allamakee and similar soils
- Frankville and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

162D2—Downs silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Downs and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Allamakee and similar soils
- Frankville and similar soils
- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

162E2—Downs silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Downs and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None

Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Allamakee and similar soils
- Frankville and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Dubuque Series

Drainage class: Well drained
Permeability: Moderate in the upper part, slow in the lower part
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Parent material: Loess and a thin layer of clayey residuum over limestone bedrock
Native vegetation: Deciduous trees
Slope range: 5 to 25 percent

Typical Pedon

Dubuque silt loam, 5 to 9 percent slopes, in a wooded pasture, 1,060 feet north and 640 feet east of the center of sec. 16, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 26 minutes, and 5 seconds N. and longitude 43 degrees, 18 minutes, and 29 seconds W.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

E—3 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak thick and thin platy structure; friable; few fine and common medium roots; slightly acid; clear smooth boundary.

BE—7 to 12 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; few fine and medium roots; medium acid; clear smooth boundary.

Bt1—12 to 16 inches; yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; few fine and medium roots; few grayish silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 24 inches; dark yellowish brown (10YR 4/6) silty clay loam; moderate fine and very fine angular blocky structure; firm; dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine and medium roots; medium acid; clear smooth boundary.

Bt3—24 to 27 inches; dark yellowish brown (10YR 4/6) silty clay loam; weak medium and fine prismatic structure parting to moderate medium and fine subangular blocky; firm; dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine and medium roots; medium acid; abrupt smooth boundary.

2Bt4—27 to 28 inches; dark yellowish brown (10YR 3/4) silty clay; moderate medium and fine subangular blocky structure; firm; few fine and medium roots; common limestone fragments ½ to 1 inch in diameter; mildly alkaline; abrupt wavy boundary.

2R—28 to 60 inches; fractured limestone bedrock.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Depth to bedrock: 20 to 40 inches

A horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam

Ap horizon (if it occurs):
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5

Chroma—3 to 6
Texture—silty clay loam

2Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—3 to 6
Texture—silty clay or clay

703C—Dubuque silt loam, 5 to 9 percent slopes

Composition

Dubuque and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 30 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Frankville and similar soils
• Soils that have bedrock at a depth of more than 40 inches

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

703C2—Dubuque silt loam, 5 to 9 percent slopes, moderately eroded

Composition

Dubuque and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 30 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches (low)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Areas of severely eroded soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

703D—Dubuque silt loam, 9 to 14 percent slopes

Composition

Dubuque and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills

Position on landform: Head slopes, nose slopes, and side slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 30 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Areas of eroded soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

703D2—Dubuque silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Dubuque and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 30 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches (low)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Areas of severely eroded soils
• Soils that have bedrock at a depth of more than 40 inches

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

703E—Dubuque silt loam, 14 to 18 percent slopes

Composition

Dubuque and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 30 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit,

such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nordness and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

703E2—Dubuque silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Dubuque and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 30 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches (low)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nordness and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

703F—Dubuque silt loam, 18 to 25 percent slopes

Composition

Dubuque and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 30 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nordness and similar soils
- Limestone bedrock outcrops

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Eitzen Series

Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Flood plains and uplands

Landform: Flood plains and drainageways
Parent material: Alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 5 percent

Typical Pedon

Eitzen silt loam, 0 to 2 percent slopes, in a cultivated field, 540 feet west and 50 feet south of the northeast corner of sec. 14, T. 97 N., R. 5 W.; U.S.G.S. Rossville, Iowa, Topographic Quadrangle; latitude 91 degrees, 23 minutes, and 30 seconds N. and longitude 43 degrees, 13 minutes, and 32 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

C—9 to 30 inches; stratified very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), and grayish brown (10YR 5/2) silt loam; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; neutral; abrupt smooth boundary.

Ab1—30 to 37 inches; black (10YR 2/1) silt loam; weak fine and very fine subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

Ab2—37 to 47 inches; very dark gray (10YR 3/1) and black (10YR 2/1) silt loam; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Ab3—47 to 53 inches; very dark grayish brown (10YR 3/2) silt loam; very dark gray (10YR 3/1) coatings on faces of peds; few streaks and pockets of dark brown (10YR 4/3); weak fine and medium subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bwb—53 to 60 inches; dark brown (10YR 4/3) silt loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; few very fine roots; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Depth to Ab horizon: 20 to 36 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

C horizon:
Hue—10YR
Value—dominantly 2 or 3; 3 to 5 in strata
Chroma—1 to 3
Texture—silt loam

Ab horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bwb horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

85—Eitzen silt loam, 0 to 2 percent slopes

Composition

Eitzen and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.1 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Orion and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

85B—Eitzen silt loam, 2 to 5 percent slopes

Composition

Eitzen and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Drainageways
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.1 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Orion and similar soils
- Volney and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Elon Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform: Flood plains
Parent material: Alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 2 percent

Typical Pedon

Elon silt loam, 0 to 2 percent slopes, in a cultivated field, 1,550 feet north and 2,600 feet east of the southwest corner of sec. 13, T. 96 N., R. 5 W.; U.S.G.S. Rossville, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 48 seconds N. and longitude 43 degrees, 7 minutes, and 13 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C1—9 to 16 inches; stratified very dark gray (10YR 3/1), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2) silt loam; common medium distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; common very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C2—16 to 38 inches; stratified very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), dark grayish brown (10YR 4/2), and grayish brown (10YR 5/2) silt loam; few fine distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; few very fine roots in the upper part; strong effervescence; moderately alkaline; clear smooth boundary.

C3—38 to 50 inches; stratified dark gray (10YR 4/1), very dark gray (10YR 3/1), and grayish brown (10YR 5/2) silt loam; common fine distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; mildly alkaline; abrupt smooth boundary.

C4—50 to 53 inches; stratified very dark gray (10YR 3/1), dark gray (10YR 4/1), black (10YR 2/1), and grayish brown (2.5Y 5/2) silt loam; common medium distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; mildly alkaline; abrupt smooth boundary.

C5—53 to 60 inches; stratified dark gray (10YR 4/1) and grayish brown (2.5Y 5/2) silt loam; common medium distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; neutral.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to bedrock: Greater than 60 inches

Ap or A horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—1 to 3
Texture—silt loam

843—Elon silt loam, 0 to 2 percent slopes

Composition

Elon and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Calcareous alluvium
Flooding: Occasional
Depth to the water table: 2 to 4 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that are noncalcareous to a depth of 40 inches

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Fayette Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills
Geomorphic component: Divides, interfluves, side slopes, and head slopes
Hillslope position: Summits, shoulders, and back slopes
Parent material: Loess
Native vegetation: Deciduous trees
Slope range: 2 to 40 percent

Typical Pedon

Fayette silt loam, 2 to 5 percent slopes, in a wooded area, 2,080 feet east and 720 feet south of the northwest corner of sec. 6, T. 96 N., R. 3 W.; U.S.G.S. Harpers Ferry, Iowa, Topographic Quadrangle; latitude 91 degrees, 14 minutes, and 35 seconds N. and longitude 43 degrees, 10 minutes, and 5 seconds W.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine and very fine granular structure; friable; few medium and common very fine roots; neutral; clear smooth boundary.

E1—3 to 8 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; moderate thin platy structure; friable; few medium and few fine roots; neutral; clear smooth boundary.

E2—8 to 10 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; few fine and few very fine roots; very strongly acid; clear smooth boundary.

BE—10 to 13 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few very fine roots; very strongly acid; clear smooth boundary.

Bt1—13 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few very fine roots; very strongly acid; gradual smooth boundary.

Bt2—17 to 37 inches; dark yellowish brown (10YR 4/4) silty clay loam; coarse medium and fine subangular and angular blocky structure; friable; thin continuous brown (10YR 4/3) clay films; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; some dark organic stains on faces of peds; few fine and few very fine roots; strongly acid; gradual smooth boundary.

BC—37 to 51 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse subangular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; some dark organic stains on faces of peds; few very fine roots; medium acid; gradual smooth boundary.

C—51 to 60 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) silt loam; massive with distinct vertical cleavage planes; friable; common medium distinct yellowish brown (10YR 5/8) mottles; thin discontinuous brown (10YR 4/3) clay films; patchy light gray (10YR 6/1 dry) silt

coatings on cleavage planes; few fine and few very fine roots; slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—1 to 4
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam

BC and C horizons:
Hue—10YR
Value—4 or 5
Chroma—4
Texture—silt loam

40D—Fayette silt loam, karst, 2 to 14 percent slopes

Composition

Fayette and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 2 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Downs and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163B—Fayette silt loam, 2 to 5 percent slopes

Composition

Fayette and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Downs and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163B2—Fayette silt loam, 2 to 5 percent slopes, moderately eroded

Composition

Fayette and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Downs and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163C—Fayette silt loam, 5 to 9 percent slopes

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163C2—Fayette silt loam, 5 to 9 percent slopes, moderately eroded

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches

Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163D—Fayette silt loam, 9 to 14 percent slopes

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163D2—Fayette silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163E—Fayette silt loam, 14 to 18 percent slopes

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163E2—Fayette silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163F—Fayette silt loam, 18 to 25 percent slopes

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

163G—Fayette silt loam, 25 to 40 percent slopes

Composition

Fayette and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 25 to 40 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Festina Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads
Parent material: Silty alluvium
Native vegetation: Deciduous trees and prairie grasses
Slope range: 2 to 9 percent

Typical Pedon

Festina silt loam, 2 to 5 percent slopes, in a cultivated field, 2,240 feet south and 2,320 feet east of the northwest corner of sec. 20, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 20 minutes, and 28 seconds N. and longitude 43 degrees, 27 minutes, and 55 seconds W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; neutral; abrupt smooth boundary.

E—8 to 11 inches; dark brown (10YR 4/3) silt loam; weak thin platy structure; friable; few fine roots; neutral; clear smooth boundary.

BE—11 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; thin discontinuous dark brown (10YR 4/3)

clay films on faces of peds; few patchy light gray (10YR 7/1 dry) silt coatings; weak fine subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bt1—16 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; common patchy light gray (10YR 7/1) silt coatings; weak medium prismatic structure parting to weak fine and medium subangular blocky; friable; very few dark concretions (iron and manganese oxides); few fine roots; medium acid; gradual smooth boundary.

Bt2—25 to 32 inches; dark yellowish brown (10YR 4/4) silt loam; common thin continuous dark brown (10YR 4/3) clay films on faces of peds; common patchy light gray (10YR 7/1) silt coatings; weak medium prismatic structure parting to weak medium subangular blocky; friable; few dark concretions (iron and manganese oxides); few fine roots; medium acid; clear smooth boundary.

BC—32 to 38 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct grayish brown (2.5Y 5/2) and few fine faint dark yellowish brown (10YR 4/6) mottles; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; few patchy light gray (10YR 7/1) silt coatings; weak medium prismatic structure; friable; few dark concretions (iron and manganese oxides); few very fine roots; medium acid; clear smooth boundary.

C1—38 to 56 inches; mottled grayish brown (2.5Y 5/2), brown (10YR 5/3), and dark yellowish brown (10YR 4/4) silt loam; few patchy light gray (10YR 7/1) silt coatings; massive; friable; common dark concretions (iron and manganese oxides); medium acid; clear smooth boundary.

C2—56 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine prominent strong brown (7.5YR 4/6), common fine distinct dark yellowish brown (10YR 4/6), and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid.

Range In Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

Ap horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—silt loam

978B—Festina silt loam, 2 to 5 percent slopes

Composition

Festina and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Richwood and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

978C—Festina silt loam, 5 to 9 percent slopes

Composition

Festina and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Frankville Series

Drainage class: Well drained
Permeability: Moderate in the upper part, slow in the lower part
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Parent material: Loess over limestone bedrock
Native vegetation: Prairie grasses and open forest
Slope range: 5 to 18 percent

Typical Pedon

Frankville silt loam, 9 to 14 percent slopes, in a cultivated field, 1,000 feet east and 1,050 feet south of the northwest corner of sec. 11, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 31 minutes, and 23 seconds N. and longitude 43 degrees, 14 minutes, and 16 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam; few brown (10YR 4/3) streaks and pockets; weak fine subangular blocky structure; friable; common very fine and few fine roots; medium acid; abrupt smooth boundary.

Bt1—7 to 13 inches; dark yellowish brown (10YR 4/4) silty clay loam; few very dark gray (10Y 3/1) mixings; weak fine subangular blocky structure; friable; many thin discontinuous dark brown (10YR 3/3) clay films; few very fine roots; slightly acid; clear smooth boundary.

Bt2—13 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films; few very fine roots; strongly acid; clear smooth boundary.

Bt3—22 to 26 inches; brown (10YR 4/3) silt loam; weak medium and fine subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) clay films; few very fine roots; strongly acid; clear smooth boundary.

2Bt4—26 to 33 inches; dark brown (7.5YR 4/4) and brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; thick discontinuous dark brown (10YR 3/3) clay films; few very fine roots; slightly acid; abrupt wavy boundary.

2R—33 to 60 inches; limestone bedrock.

Range in Characteristics

Depth to bedrock: 20 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—2 or 3
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silt loam

2Bt horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—silty clay loam, silty clay, or clay

903C2—Frankville silt loam, 5 to 9 percent slopes, moderately eroded

Composition

Frankville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.8 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of more than 40 inches
• Areas of uneroded soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

903D—Frankville silt loam, 9 to 14 percent slopes

Composition

Frankville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.1 inches (moderate)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of more than 40 inches
• Areas of eroded soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

903D2—Frankville silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Frankville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained

Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.8 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have bedrock at a depth of more than 40 inches
- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

903E2—Frankville silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Frankville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.8 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nordness and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Garwin Series

Drainage class: Poorly drained
Permeability: Moderate
Landscape: Uplands
Landform: Interfluves
Geomorphic component: Swales
Parent material: Loess
Native vegetation: Prairie grasses and sedges
Slope range: 0 to 2 percent

Typical Pedon

Garwin silty clay loam, 0 to 2 percent slopes, in a cultivated field, 1,620 feet east and 315 feet north of the southwest corner of sec. 8, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 50 seconds N. and longitude 43 degrees, 13 minutes, and 38 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to weak fine granular; friable; common very fine and few fine roots; slightly acid; clear smooth boundary.

A1—9 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (N 3/0) dry; moderate medium and fine subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

A2—14 to 20 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (N 4/0) dry; few fine distinct grayish brown (2.5Y 5/2) and few fine prominent strong brown (7.5YR 5/8) mottles; weak fine granular structure; friable; few very fine roots; neutral; clear smooth boundary.

BA—20 to 24 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown and few

fine distinct grayish brown (2.5Y 5/2) mottles; weak fine prismatic structure parting to weak fine subangular blocky; friable; few very fine roots; few black (10YR 2/1) iron or manganese accumulations; neutral; gradual smooth boundary.

Bg1—24 to 31 inches; olive gray (5Y 5/2) silt loam; many fine prominent strong brown (7.5YR 5/8) mottles; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; friable; few very fine roots; few black (10YR 2/1) iron or manganese accumulations; mildly alkaline; gradual smooth boundary.

Bg2—31 to 38 inches; olive gray (5Y 5/2) silt loam; many fine prominent strong brown (7.5YR 5/8) mottles; weak fine and medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine roots; common black (10YR 2/1) iron or manganese accumulations; mildly alkaline; gradual smooth boundary.

Bg3—38 to 43 inches; olive gray (5Y 5/2) silt loam; common fine prominent strong brown (7.5YR 5/8) mottles; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; friable; few very fine roots; few black (10YR 2/1) iron or manganese oxides; mildly alkaline; clear smooth boundary.

Cg1—43 to 56 inches; olive gray (5Y 5/2) silt loam; common and few fine prominent strong brown (7.5YR 5/6 and 5/8) mottles; massive; friable; few black (10YR 2/1) iron or manganese accumulations; mildly alkaline; abrupt smooth boundary.

Cg2—56 to 60 inches; olive gray (5Y 5/2) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; friable; few black (10YR 2/1) iron or manganese accumulations; mildly alkaline.

Range in Characteristics

Depth to carbonates: 48 to 72 inches
Depth to bedrock: Greater than 60 inches
Thickness of the mollic epipedon: 18 to 24 inches

A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—7.5YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

118—Garwin silty clay loam, 0 to 2 percent slopes

Composition

Garwin and similar soils: 100 percent

Setting

Landform: Interfluves
Position on landform: Summits of hills
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Loess
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 12.7 inches (high)
Organic matter content in the surface layer: About 6.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Hawick Series

Drainage class: Excessively drained
Permeability: Very rapid
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads and risers
Parent material: Alluvium over sand and gravel
Native vegetation: Prairie grasses and deciduous trees
Slope range: 2 to 40 percent

Typical Pedon

Hawick gravelly sand, 18 to 40 percent slopes, in a wooded pasture, 1,200 feet west and 250 feet south of the northeast corner of sec. 20, T. 99 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 37 seconds N. and longitude 43 degrees, 23 minutes, and 9 seconds W.

A—0 to 10 inches; black (10YR 2/1) gravelly sand (about 20 percent gravel), dark gray (10YR 4/1) dry; weak fine granular structure; very friable; few medium, common fine, and many very fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

C1—10 to 17 inches; brown (10YR 5/3) sand (about 10 percent gravel); single grained; loose; few medium and common very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C2—17 to 30 inches; pale brown (10YR 6/3) sand (about 5 percent gravel); single grained; loose; few medium, few fine, and few very fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

C3—30 to 33 inches; pale brown (10YR 6/3) sand (about 10 percent gravel); single grained; loose; few fine and few very fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

C4—33 to 46 inches; pale brown (10YR 6/3) sand (about 5 percent gravel); single grained; loose; few very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C5—46 to 60 inches; pale brown (10YR 6/3) sand (about 10 percent gravel); single grained; loose; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 20 inches
Depth to bedrock: Greater than 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—gravelly sand

C horizon:
Hue—10YR
Value—4 to 6
Chroma—3 to 6
Texture—sand or gravelly sand

740C—Hawick gravelly sand, 2 to 9 percent slopes

Composition

Hawick and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 2 to 9 percent

Component Description

Surface layer texture: Gravelly sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Loamy alluvium over calcareous sand and gravel
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.8 inches (very low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

740G—Hawick gravelly sand, 18 to 40 percent slopes

Composition

Hawick and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 18 to 40 percent

Component Description

Surface layer texture: Gravelly sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Loamy alluvium over calcareous sand and gravel
Flooding: None
Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 2.8 inches (very low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have a surface layer of sandy loam

Major Uses of the Unit

• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

Huntsville Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Flood plains
Landform: Flood plains
Parent material: Alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 5 percent

Typical Pedon

Huntsville silt loam, 0 to 2 percent slopes, in a cultivated field, 790 feet north and 2,390 feet west of the southeast corner of sec. 1, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 43 seconds N. and longitude 43 degrees, 19 minutes, and 45 seconds W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

A1—8 to 12 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.

A2—12 to 23 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

A3—23 to 30 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.

A4—30 to 39 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium prismatic structure parting to weak fine subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

BA—39 to 48 inches; dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silt loam; weak medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

Bw—48 to 60 inches; dark brown (10YR 4/3) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the mollic epipedon: 24 to 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

C horizon (if it occurs):
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—silt loam

98—Huntsville silt loam, 0 to 2 percent slopes

Composition

Huntsville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.4 inches (high)

Organic matter content in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lawson and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

98B—Huntsville silt loam, 2 to 5 percent slopes

Composition

Huntsville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.4 inches (high)
Organic matter content in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of recent stratified alluvium

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Ion Series

Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Flood plains
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent

Typical Pedon

Ion silt loam, 0 to 2 percent slopes, in a cultivated field, 1,800 feet east and 1,850 feet south of the northwest corner of sec. 30, T. 100 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 36 minutes, and 15 seconds N. and longitude 43 degrees, 27 minutes, and 8 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; moderately alkaline; slight effervescence; clear smooth boundary.

C1—9 to 33 inches; stratified very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), grayish brown (10YR 5/2), and brown (10YR 5/3) silt loam; massive with thin to thick platelike structure resulting from stratification; friable; few very fine roots; moderately alkaline; slight effervescence; clear smooth boundary.

C2—33 to 36 inches; stratified black (10YR 2/1), very dark grayish brown (10YR 3/2), grayish brown (10YR 5/2), and brown (10YR 5/3) silt loam; massive with thin to thick platelike structure resulting from stratification; friable; moderately alkaline; slight effervescence; clear smooth boundary.

2Ab—36 to 60 inches; black (10YR 2/1) silt loam; moderate fine and very fine subangular blocky structure; friable; few small snail-shell fragments; moderately alkaline; slight effervescence.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to bedrock: Greater than 60 inches
Depth to Ab horizon: 20 to 40 inches

A or Ap horizon:
Hue—10YR
Value—3
Chroma—2 or 3
Texture—silt loam

C horizon:
Hue—10YR
Value—2 to 5
Chroma—1 to 3
Texture—silt loam

2Ab horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

2670—Ion silt loam, 0 to 2 percent slopes

Composition

Ion and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Calcareous local alluvium
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.7 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Somewhat poorly drained soils

Major Uses of the Unit

• Cropland (fig. I-6)
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

Lacrescent Series

Drainage class: Well drained
Permeability: Moderate in the upper part, moderately rapid in the lower part
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Back slopes
Parent material: Pedisediment
Native vegetation: Deciduous trees
Slope range: 14 to 70 percent

Typical Pedon

Lacrescent silt loam, 25 to 70 percent slopes, in a wooded area, 500 feet west and 940 feet south of the northeast corner of sec. 11, T. 99 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 30 minutes, and 47 seconds N. and longitude 43 degrees, 24 minutes, and 41 seconds W.

A1—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium and fine subangular blocky structure; friable; few coarse, common medium, many fine, and many very fine roots; about 5 percent coarse fragments (2 to 5 centimeters); neutral; clear smooth boundary.

A2—9 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; very dark gray (10YR 3/1) coatings on faces of peds; moderate medium and fine subangular blocky structure; friable; few coarse, few medium, common fine, and common very fine roots; about 5 percent coarse fragments (2 to 5 centimeters); neutral; clear smooth boundary.

Bw1—12 to 14 inches; brown and dark brown (10YR 4/3) gravelly loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; friable; few coarse, few medium, and few fine roots; about 15 percent coarse fragments (2 to 10 centimeters); neutral; clear smooth boundary.

Bw2—14 to 20 inches; dark yellowish brown (10YR 4/4) loam; discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; moderate fine and very fine subangular blocky structure; friable; common coarse, few medium, and few fine roots; about 5 percent coarse fragments (2 to 7 centimeters); about 5 percent coarse fragments (8 to 20 centimeters); slightly acid; abrupt wavy boundary.

Bw3—20 to 27 inches; dark yellowish brown (10YR 4/4) cobbly loam; brown and dark brown (10YR 4/3) coatings on faces of peds; moderate fine and very fine subangular blocky structure; friable; few

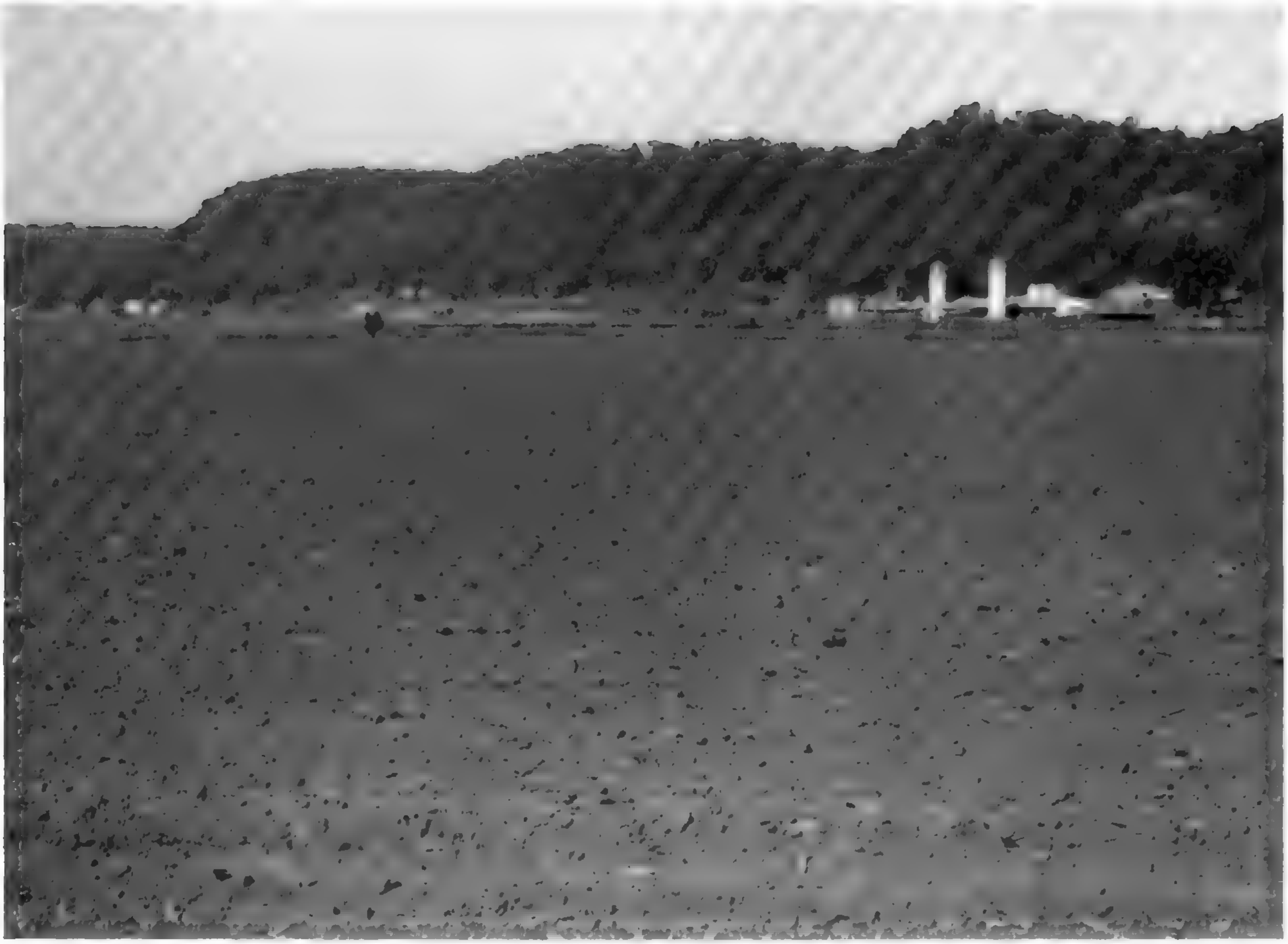

Figure I-6.—A tilled area of Ion silt loam, 0 to 2 percent slopes. This soil is well suited to row crops if the occasional flooding is controlled. Lacrescent silt loam, 25 to 70 percent slopes, is in the steep wooded areas in the background.

medium and few fine roots; about 10 percent coarse fragments (2 to 7 centimeters); about 20 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 50 centimeters); slightly acid; abrupt wavy boundary.

BC—27 to 44 inches; dark yellowish brown (10YR 4/4) very cobbly loam; weak fine subangular blocky structure; friable; few fine and few very fine roots; about 15 percent coarse fragments (2 to 7 centimeters); about 35 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 60 centimeters); about 5 percent coarse fragments (60 to 75 centimeters); slight effervescence; moderately alkaline; gradual wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) very cobbly loam; massive; friable; few medium, few fine, and few very fine roots; about 15 percent coarse fragments (2 to 7 centimeters); about 40 percent coarse fragments (8 to 25 centimeters); about 10 percent coarse fragments (25 to 60 centimeters); about 10 percent coarse fragments (60 to 100 centimeters); strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 36 inches
Depth to bedrock: 48 to more than 60 inches
Thickness of the mollic epipedon: 10 to 20 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bw horizon:
Hue—10YR
Value—4
Chroma—3 or 4
Texture—silt loam, loam, or sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—loam, silt loam, or sandy loam

840E—Lacrescent silt loam, 14 to 18 percent slopes

Composition

Lacrescent and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Pedisediment
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.0 inches (moderate)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Bedrock outcrops

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

840F—Lacrescent silt loam, 18 to 25 percent slopes

Composition

Lacrescent and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Pedisediment
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.0 inches (moderate)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Bedrock outcrops

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

840G—Lacrescent silt loam, 25 to 70 percent slopes

Composition

Lacrescent and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 25 to 70 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Pedisediment
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.0 inches (moderate)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bedrock outcrops

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lawson Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform: Flood plains
Parent material: Alluvium
Native vegetation: Prairie grasses with scattered trees
Slope range: 0 to 2 percent

Typical Pedon

Lawson silt loam, 0 to 2 percent slopes, in a cultivated field, 2,000 feet east and 2,050 feet south of the northwest corner of sec. 25, T. 99 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 15 minutes, and 54 seconds N. and longitude 43 degrees, 21 minutes, and 52 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; clear smooth boundary.

A1—9 to 20 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure parting to weak fine subangular blocky; friable; neutral; clear smooth boundary.

A2—20 to 32 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; few fine faint brown (10YR 4/3) mottles; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

C1—32 to 44 inches; mottled dark grayish brown (2.5Y 4/2) and dark yellowish brown (10YR 4/6) silt loam; thin discontinuous very dark brown (10YR 2/2) coatings on faces of peds; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

C2—44 to 60 inches; mottled dark grayish brown (2.5Y 4/2), dark brown (10YR 4/3), and grayish brown (10YR 5/2) silt loam; very dark gray (10YR 3/1) clay flows in root channels; massive; friable; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 to 3
Texture—silt loam

484—Lawson silt loam, 0 to 2 percent slopes

Composition

Lawson and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Local alluvium
Flooding: Occasional
Depth to the water table: 1 to 3 feet
Available water capacity to 60 inches or root-limiting layer: About 12.0 inches (high)

Organic matter content in the surface layer: About 5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Otter and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lycurgus Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills
Geomorphic component: Base slopes
Hillslope position: Foot slopes
Parent material: Loamy sediments over loess
Native vegetation: Prairie grasses with scattered trees
Slope range: 9 to 25 percent

Typical Pedon

Lycurgus silt loam, 14 to 18 percent slopes, in a cultivated field, 1,950 feet east and 2,050 feet north of the southwest corner of sec. 4, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 26 minutes, and 27 seconds N. and longitude 43 degrees, 19 minutes, and 58 seconds W.

A1—0 to 3 inches; very dark brown (10YR 2/2) silt loam (19 percent sand), dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many medium discontinuous tubular and many fine discontinuous tubular roots; few fine tubular pores; neutral; clear smooth boundary.

A2—3 to 7 inches; very dark brown (10YR 2/2) silt loam (20 percent sand), dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many medium discontinuous tubular roots; few fine tubular pores; neutral; clear smooth boundary.

A3—7 to 13 inches; 85 percent dark brown (10YR 3/3), 10 percent very dark grayish brown (10YR 3/2), and 5 percent very dark brown (10YR 2/2) silt loam (19 percent sand), brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; common very fine discontinuous tubular roots; few fine tubular pores; neutral; clear smooth boundary.

BA—13 to 20 inches; 85 percent brown and dark brown (10YR 4/3), 10 percent dark brown (10YR 3/3), and 5 percent very dark grayish brown (10YR 3/2) silt loam (18 percent sand); weak fine and medium subangular blocky structure; friable; few very fine discontinuous tubular and few fine discontinuous tubular roots; few fine tubular pores; less than 1 percent gravel-sized particles; neutral; gradual smooth boundary.

Bt1—20 to 30 inches; dark yellowish brown (10YR 4/4) silt loam (16 percent sand); weak medium subangular blocky structure; friable; few fine discontinuous tubular roots; few fine tubular pores; discontinuous faint very dark grayish brown (10YR 3/2) clay films on vertical and horizontal faces of peds; less than 1 percent chert fragments; less than 1 percent sandstone fragments; neutral; gradual smooth boundary.

2Bt2—30 to 38 inches; yellowish brown (10YR 5/6) silty clay loam (6 percent sand); few fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine discontinuous tubular roots; few fine tubular pores; discontinuous faint dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; gradual smooth boundary.

2Bt3—38 to 47 inches; yellowish brown (10YR 5/4) silty clay loam (6 percent sand); few fine faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; few fine discontinuous tubular roots; few fine tubular pores; discontinuous faint dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; gradual smooth boundary.

2Bt4—47 to 60 inches; yellowish brown (10YR 5/4) silt loam (7 percent sand); few fine faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; few fine discontinuous tubular roots; few fine tubular pores; discontinuous distinct dark yellowish brown (10YR 4/4) clay films on vertical and horizontal faces of peds; slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of loamy sediments: 20 to 48 inches

Percent sand in loamy sediments: 10 to 40 percent

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam or silty clay loam

C horizon (if it occurs):
Hue—10YR
Value—4 to 6
Chroma—4 to 6
Texture—silt loam

1120D—Lycurgus silt loam, 9 to 14 percent slopes

Composition

Lycurgus and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy sediments over silty deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a thinner surface layer
- Soils that have a surface layer of sandy loam
- Soils that have a thicker surface soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1120E—Lycurgus silt loam, 14 to 18 percent slopes

Composition

Lycurgus and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy sediments over silty deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a thinner surface soil
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1120F—Lycurgus silt loam, 18 to 25 percent slopes

Composition

Lycurgus and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy sediments over silty deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a thinner surface soil
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Massbach Series

Drainage class: Moderately well drained
Permeability: Moderate in the upper part, very slow or slow in the lower part
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes
Hillslope position: Back slopes
Parent material: Loess over weathered shale
Native vegetation: Prairie grasses and open forest
Slope range: 3 to 15 percent

Typical Pedon

Massbach silt loam, 3 to 9 percent slopes, in a cultivated field, 2,600 feet north and 600 feet east of the southwest corner of sec. 7, T. 97 N., R. 4 W.; U.S.G.S. Waterville, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 3 seconds N. and longitude 43 degrees, 13 minutes, and 58 seconds W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky structure; friable; common very fine and few fine roots; slightly acid; abrupt smooth boundary.

BE—9 to 13 inches; dark grayish brown (10YR 4/2) silt loam; weak medium platy structure parting to weak fine and very fine subangular blocky; friable; few very fine roots; medium acid; clear smooth boundary.

Bt1—13 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few very fine roots; strongly acid; gradual smooth boundary.

Bt2—22 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine prismatic structure parting to weak medium and fine subangular blocky; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few very fine roots; strongly acid; clear smooth boundary.

Bt3—29 to 35 inches; olive (5Y 5/3) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; few very fine roots; very dark brown (10YR 2/2) accumulations; medium acid; abrupt wavy boundary.

2BC—35 to 41 inches; greenish gray (5GY 6/1) shale; few fine distinct olive yellow mottles; massive; very firm; many pale olive (5Y 6/3) carbonate layers; neutral.

2Cr—41 inches; shale bedrock.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Depth to unconsolidated bedrock: 20 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

BE horizon:
Hue—10YR
Value—4

Chroma—2 or 3
Texture—silt loam

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 or 5
Chroma—2 to 6
Texture—silt loam or silty clay loam

2BC horizon:
Hue—5Y, 5GY, or 5G
Value—5 or 6
Chroma—1 to 6
Texture—silty clay or clay

721C—Massbach silt loam, 3 to 9 percent slopes

Composition

Massbach and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes
Slope: 3 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 40 to 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess over weathered shale
Flooding: None
Seasonal high water table: Perched at a depth of 3 to 5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.0 inches (moderate)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of shale bedrock
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

721D—Massbach silt loam, 9 to 15 percent slopes

Composition

Massbach and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes
Slope: 9 to 15 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 40 to 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess over weathered shale
Flooding: None
Seasonal high water table: Perched at a depth of 3 to 5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.0 inches (moderate)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of shale bedrock
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Medary Series

Drainage class: Well drained
Permeability: Slow

Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Risers
Parent material: Lacustrine deposits
Native vegetation: Deciduous trees
Slope range: 14 to 45 percent

Typical Pedon

Medary silt loam, 14 to 45 percent slopes, in a wooded pasture, 450 feet east and 220 feet north of the southwest corner of sec. 33, T. 99 N., R. 3 W.; U.S.G.S. Lansing, Iowa, Topographic Quadrangle; latitude 91 degrees, 12 minutes, and 37 seconds N. and longitude 43 degrees, 20 minutes, and 39 seconds W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few medium and few fine roots; slightly acid; clear smooth boundary.

BE—4 to 8 inches; brown and dark brown (7.5YR 4/4) and very dark grayish brown (10YR 3/2) silty clay loam; few fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; friable; few medium and few fine roots; slightly acid; clear smooth boundary.

Bt1—8 to 18 inches; brown and dark brown (7.5YR 4/4) silty clay; moderate fine and very fine subangular blocky structure; firm; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; few fine roots; medium acid; gradual smooth boundary.

Bt2—18 to 23 inches; brown and dark brown (10YR 4/3) silty clay; few medium distinct strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films on faces of peds; few fine roots; medium acid; abrupt smooth boundary.

Bt3—23 to 26 inches; brown and dark brown (10YR 4/3) silty clay; few fine distinct strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; common carbonate concretions and common disseminated carbonates on faces of peds; few fine roots; neutral; abrupt smooth boundary.

C1—26 to 37 inches; stratified reddish brown (5YR 4/3) and brown and dark brown (7.5YR 4/4) clay to sandy loam; massive with vertical cleavage planes; firm and friable; thin discontinuous dark brown (7.5YR 3/2) clay films on faces of cleavage planes; common disseminated carbonates; few fine roots; strong effervescence; mildly alkaline; abrupt smooth boundary.

C2—37 to 44 inches; mottled light brownish gray (10YR 6/2), brownish yellow (10YR 6/6), and strong brown (7.5YR 4/6) silt loam; massive; friable; pockets of disseminated carbonates; slight effervescence; mildly alkaline; abrupt smooth boundary.

C3—44 to 52 inches; stratified light brownish gray (10YR 6/2) and brown and dark brown (7.5YR 4/4) silt loam, clay, and sandy loam; massive; firm and friable; pockets of disseminated carbonates; slight effervescence; mildly alkaline; abrupt smooth boundary.

C4—52 to 60 inches; stratified brown (10YR 5/3), dark brown, and brown (7.5YR 4/4) and light brownish gray (10YR 6/2) silt loam; few fine distinct dark brown (7.5YR 3/2) and strong brown (7.5YR 4/6) mottles; massive; friable; violent effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 60 inches
Depth to bedrock: Greater than 60 inches

A or Ap horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—1 to 4
Texture—silt loam

BE horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—2 to 6
Texture—silt loam or silty clay loam

Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3 to 6
Texture—silty clay loam, silty clay, or clay

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 to 8
Texture—strata of silty clay, clay, silt loam, or sandy loam

951G—Medary silt loam, 14 to 45 percent slopes

Composition

Medary and similar soils: 100 percent

Setting

Landform: Terraces
Slope: 14 to 45 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Muscatine Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Uplands
Landform: Interfluves
Geomorphic component: Interfluves
Hillslope position: Summits
Parent material: Loess
Native vegetation: Tall prairie grasses
Slope range: 1 to 4 percent

Typical Pedon

Muscatine silt loam, 1 to 4 percent slopes, in a cultivated field, 50 feet east and 1,000 feet south of the center of sec. 8, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 34 seconds N. and longitude 43 degrees, 13 minutes, and 51 seconds W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; clear smooth boundary.

A—10 to 14 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; clear smooth boundary.

AB—14 to 17 inches; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bg1—17 to 22 inches; dark grayish brown (10YR 4/2) silty clay loam; continuous very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) coatings on faces of peds; weak fine prismatic structure parting to weak fine and medium subangular blocky; friable; few very fine roots; neutral; clear smooth boundary.

Bg2—22 to 26 inches; dark grayish brown (2.5Y 4/2) silty clay loam; continuous dark grayish brown (10YR 4/2) coatings on faces of peds; few fine distinct brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

Bg3—26 to 34 inches; dark grayish brown (2.5Y 4/3) silty clay loam; many fine and few coarse very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine distinct brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; neutral; gradual smooth boundary.

BCg—34 to 43 inches; mottled dark grayish brown (2.5Y 4/3), dark brown (7.5YR 4/4), and dark yellowish brown (10YR 4/4) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine root pores with dark grayish brown (10YR 4/2) cutans on sides; neutral; gradual smooth boundary.

Cg—43 to 60 inches; mottled light brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2), and yellowish brown (10YR 5/6 and 5/4) silt loam; massive; friable; few fine root pores with dark grayish brown (10YR 4/2) cutans on sides; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the mollic epipedon: 12 to 22 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bg and Bw horizons:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam

BC and C horizons:
Hue—2.5Y or 5Y

Value—4 to 6
Chroma—2 to 6
Texture—silt loam or silty clay loam

119B—Muscatine silt loam, 1 to 4 percent slopes

Composition

Muscatine and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Interfluves
Position on landform: Summits of hills
Slope: 1 to 4 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 2 to 4 feet
Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)
Organic matter content in the surface layer: About 5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Garwin and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Nordness Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Parent material: Loamy pedisediment over limestone bedrock
Native vegetation: Deciduous trees
Slope range: 5 to 60 percent

Typical Pedon

Nordness silt loam, 14 to 18 percent slopes, in a wooded area, 1,200 feet north and 800 feet east of the center of sec. 16, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 26 minutes, and 17 seconds N. and longitude 43 degrees, 18 minutes, and 32 seconds W.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; few dark grayish brown (10YR 4/2) mixings; weak very fine and fine subangular blocky structure; friable; many very fine and few fine and medium roots; mildly alkaline; abrupt smooth boundary.

E—3 to 5 inches; dark grayish brown (10YR 4/2) silt loam; some very dark gray (10YR 3/1) mixings; weak thin platy structure parting to weak very fine subangular blocky; friable; few very fine, fine, and medium roots; neutral; clear smooth boundary.

BE—5 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and very fine subangular blocky structure; friable; few very fine, fine, and medium roots; neutral; clear smooth boundary.

Bt1—12 to 14 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate very fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few medium and fine roots; slightly acid; clear smooth boundary.

2Bt2—14 to 15 inches; brown (10YR 4/3) silty clay; moderate very fine and fine subangular and angular blocky structure; firm; thin continuous brown (10YR 3/3) clay films on faces of peds; mildly alkaline; abrupt wavy boundary.

2R—15 to 60 inches; fractured limestone bedrock.

Range in Characteristics

Depth to carbonates: 8 to 20 inches
Depth to bedrock: 8 to 20 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Ap horizon (if it occurs):
Hue—10YR
Value—4
Chroma—2 or 3
Texture—silt loam

E horizon:
Hue—10YR
Value—4
Chroma—2
Texture—silt loam

Bt horizon:
Hue—10YR in the upper part, 10YR or 7.5YR in the lower part
Value—4 or 5
Chroma—3 to 6
Texture—silty clay loam in the upper part, silty clay or clay in the lower part

478G—Nordness-Rock outcrop complex, 25 to 60 percent slopes

Composition

Nordness and similar soils: About 50 percent
Rock outcrop: 40 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 25 to 60 percent

Component Description

Nordness
Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediment over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

Rock outcrop
Kind of material: Unweathered limestone bedrock
Flooding: None
Depth to the water table: Greater than 6.0 feet

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Intermixed limestone flags

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

499C—Nordness silt loam, 5 to 9 percent slopes

Composition

Nordness and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediments over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of more than 20 inches

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

499D—Nordness silt loam, 9 to 14 percent slopes

Composition

Nordness and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediments over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of more than 20 inches

Major Uses of the Unit

• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

499D2—Nordness silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Nordness and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediments over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of more than 20 inches

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

499E—Nordness silt loam, 14 to 18 percent slopes

Composition

Nordness and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediments over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of more than 20 inches

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

499E2—Nordness silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Nordness and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediments over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of more than 20 inches

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

499F—Nordness silt loam, 18 to 25 percent slopes

Composition

Nordness and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 18 to 25 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediments over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at the surface
• Soils that have bedrock at a depth of more than 20 inches

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

• Forest Land section

499G—Nordness silt loam, 25 to 40 percent slopes

Composition

Nordness and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and shoulders
Slope: 25 to 40 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: 8 to 20 inches
Drainage class: Well drained
Dominant parent material: Loamy pedisediments over limestone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches (low)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at the surface

Major Uses of the Unit

• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

Orion Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform: Flood plains
Parent material: Alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 2 percent

Typical Pedon

Orion silt loam, 0 to 2 percent slopes, in a cultivated field, 2,350 feet east and 400 feet north of the southwest corner of sec. 16, T. 98 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 19 minutes, and 13 seconds N. and longitude 43 degrees, 17 minutes, and 57 seconds W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 6/2) dry; weak medium and fine subangular blocky structure; friable; common very fine roots; mildly alkaline; abrupt smooth boundary.

C—8 to 28 inches; stratified dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), very dark grayish brown (10YR 3/2), and very dark gray (10YR 3/1) silt loam; common fine prominent strong brown (7.5YR 4/6) and few fine prominent dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; mildly alkaline; abrupt smooth boundary.

2Ab1—28 to 35 inches; black (N 2/0) loam; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

2Ab2—35 to 49 inches; black (10YR 2/1) loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

2Ab3—49 to 54 inches; very dark gray (10YR 3/1) silt loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

2Bg—54 to 60 inches; dark gray (10YR 4/1) silt loam; common fine prominent strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; friable; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Depth to 2Ab horizon: 20 to 40 inches

A or Ap horizon:
Hue—10YR
Value—3 or 4
Chroma—1 or 2
Texture—silt loam

C horizon:
Hue—10YR
Value—2 to 5
Chroma—1 to 3
Texture—silt loam

2Ab horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3

Chroma—0 to 2
Texture—silt loam, loam, or silty clay loam

2Bg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 3
Texture—silt loam or silty clay loam

930—Orion silt loam, 0 to 2 percent slopes

Composition

Orion and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Local alluvium
Flooding: Occasional
Depth to the water table: 1 to 3 feet
Available water capacity to 60 inches or root-limiting layer: About 12.4 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Arenzville and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

5040—Orthents, loamy

Description

• This map unit consists of nearly level to strongly sloping areas from which soil material has been removed for use in other areas.

Major Uses of the Unit

• Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

• Wildlife Habitat section

Otter Series

Drainage class: Poorly drained
Permeability: Moderate
Landscape: Flood plains and uplands
Landform: Flood plains
Parent material: Alluvium
Native vegetation: Prairie grasses and sedges
Slope range: 0 to 2 percent

Typical Pedon

Otter silt loam, 0 to 2 percent slopes, in a pasture, 2,160 feet south and 125 feet east of the northwest corner of sec. 25, T. 99 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 16 minutes, and 18 seconds N. and longitude 43 degrees, 21 minutes, and 51 seconds W.

Ap—0 to 9 inches; black (N 2/0) silt loam, very dark gray (N 3/0) dry; moderate very fine and fine granular structure; friable; common medium and fine roots; neutral; clear smooth boundary.

A1—9 to 14 inches; black (N 2/0) silt loam, very dark gray (N 3/0) dry; few fine prominent strong brown (7.5YR 4/6 and 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; neutral; clear smooth boundary.

A2—14 to 25 inches; very dark grayish brown (2.5Y 3/2) and very dark gray (N 3/0) silt loam, gray (N 5/0) and dark grayish brown (2.5Y 4/2) dry; few medium prominent strong brown (7.5YR 4/6 and 5/8) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; neutral; clear smooth boundary.

Cg1—25 to 41 inches; olive gray (5Y 5/2) silt loam; few fine prominent strong brown (7.5YR 4/6) mottles; massive; friable; few fine roots; mildly alkaline; clear smooth boundary.

Cg2—41 to 60 inches; gray (5Y 5/1) silt loam; few fine distinct light olive brown (2.5Y 5/6) mottles in the upper part; massive; friable; some black (N 2/0), filled worm and root channels; mildly alkaline.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

Thickness of the mollic epipedon: 24 to 40 inches

A horizon:
Hue—10YR, 7.5YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silt loam

Bg horizon (if it occurs):
Hue—10YR, 7.5YR, 2.5Y, or neutral
Value—2 to 4
Chroma—0 to 2
Texture—silt loam

Cg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 to 6
Chroma—0 to 3
Texture—silt loam

487B—Otter-Worthen complex, 1 to 4 percent slopes

Composition

Otter and similar soils: About 50 percent
Worthen and similar soils: About 45 percent
Inclusions: About 5 percent

Setting

Landform: Drainageways
Slope: Otter—0 to 2 percent; Worthen—2 to 4 percent

Component Description

Otter

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Local alluvium
Flooding: Occasional
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Organic matter content in the surface layer: About 4.5 percent (high)

Worthen

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Local alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.3 inches (high)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Somewhat poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

589—Otter silt loam, 0 to 2 percent slopes

Composition

Otter and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Flooding: Occasional
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Organic matter content in the surface layer: About 6.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arenzville and similar soils
- Areas of recent stratified overwash

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

Paintcreek Series

Drainage class: Well drained
Permeability: Slow
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Parent material: Loess over pedisediment underlain by residuum
Native vegetation: Deciduous trees
Slope range: 5 to 30 percent

Typical Pedon

Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded, in a pasture, 75 feet west and 1,550 feet north of the southeast corner of sec. 7, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 21 minutes, and 7 seconds N. and longitude 43 degrees, 29 minutes, and 53 seconds W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

BE—6 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; slightly acid; gradual wavy boundary.

Bt1—11 to 15 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine subangular blocky structure; friable; discontinuous distinct brown and dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual smooth boundary.

2Bt2—15 to 24 inches; yellowish red (5YR 5/6) clay; moderate fine subangular blocky structure; friable; continuous distinct reddish brown (5YR 4/4) clay films on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 5 percent coarse fragments (8 to 25 centimeters); strongly acid; clear smooth boundary.

2Bt3—24 to 35 inches; red (2.5YR 4/6) clay; strong fine subangular blocky structure; firm; continuous distinct red (2.5YR 4/6) clay films on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 10 percent coarse fragments (8 to 25 centimeters); very strongly acid; clear wavy boundary.

2Bt4—35 to 43 inches; red (2.5YR 4/6) cobbly clay; strong fine subangular blocky structure; firm; continuous distinct reddish brown (2.5YR 4/4) clay films on faces of peds; continuous distinct black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 25 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 60 centimeters); very strongly acid; gradual wavy boundary.

3Bt5—43 to 60 inches; yellowish red (5YR 4/6) clay; weak fine subangular blocky structure; firm; continuous distinct yellowish red (5YR 4/6) clay films on faces of peds; continuous distinct black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 10 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 60 centimeters); very strongly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the loess: 5 to 20 inches

Ap or A horizon:
Hue—10YR
Value—3 or 4 moist, 6 or 7 dry
Chroma—2 or 3
Texture—silt loam

BE horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

Bt and 2Bt horizons:
Hue—2.5YR to 7.5YR
Value—4 to 6
Chroma—4 to 6
Texture—silty clay loam, silty clay, or clay

3C horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 to 6
Texture—stratified sandy loam, loam, sandy clay loam, sand, clay, or clay loam

912C—Paintcreek silt loam, 5 to 9 percent slopes

Composition

Paintcreek and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over pedisediment underlain by residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

912D—Paintcreek silt loam, 9 to 14 percent slopes

Composition

Paintcreek and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over pedisediment underlain by residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

912D2—Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Paintcreek and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over pedisediment underlain by residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches (moderate)

Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

912E—Paintcreek silt loam, 14 to 18 percent slopes

Composition

Paintcreek and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over pedisediment underlain by residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Soils that have bedrock at a depth of less than 60 inches

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

912E2—Paintcreek silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Paintcreek and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over pedisediment underlain by residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches (moderate)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of severely eroded soils
- Soils that have bedrock at a depth of less than 60 inches

Major Uses of the Unit

- Hayland
- Pasture

• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

912F—Paintcreek silt loam, 18 to 30 percent slopes

Composition

Paintcreek and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 18 to 30 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over pedisediment underlain by residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Soils that have bedrock at a depth of less than 60 inches

Major Uses of the Unit

• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

5010—Pits, sand and gravel

Description

• This map unit consists of pits on stream terraces where sand and gravel have been removed.

5030—Pits, limestone quarries

Description

• This map unit consists of pits from which limestone has been removed.

Richwood Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads
Parent material: Silty alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 5 percent

Typical Pedon

Richwood silt loam, 0 to 2 percent slopes, in a cultivated field, 200 feet west and 1,700 feet south of the northeast corner of sec. 32, T. 100 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 27 minutes, and 7 seconds N. and longitude 43 degrees, 26 minutes, and 17 seconds W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

A—10 to 16 inches; very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bt1—16 to 27 inches; brown (10YR 4/3) silt loam; weak medium and fine subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; few very fine roots; slightly acid; gradual smooth boundary.

Bt2—27 to 31 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium and fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few very fine roots; slightly acid; gradual smooth boundary.

Bt3—31 to 38 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay

films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings; few very fine roots; neutral; gradual smooth boundary.

BC—38 to 51 inches; dark yellowish brown (10YR 4/4) silt loam; few medium prominent reddish brown (5YR 4/4) mottles; weak fine prismatic structure parting to weak medium subangular blocky; friable; patchy light gray (10YR 6/1 dry) silt coatings; few very fine roots; neutral; clear smooth boundary.

C—51 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; patchy light gray (10YR 6/1 dry) silt coatings; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 5
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 5
Texture—silt loam

977—Richwood silt loam, 0 to 2 percent slopes

Composition

Richwood and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Moderately well drained soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

977B—Richwood silt loam, 2 to 5 percent slopes

Composition

Richwood and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Organic matter content in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Festina and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

841G—Rock outcrop-Boone complex, 20 to 70 percent slopes

Composition

Rock outcrop: About 50 percent
Boone and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 20 to 70 percent

Component Description

Rock outcrop
Kind of material: Unweathered sandstone bedrock
Flooding: None
Depth to the water table: Greater than 6.0 feet

Boone
Surface layer texture: Loamy sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Sandstone
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.0 inches (very low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nordness and similar soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Rowley Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads
Parent material: Silty alluvium
Native vegetation: Prairie grasses with scattered trees
Slope range: 0 to 2 percent

Typical Pedon

Rowley silt loam, 0 to 2 percent slopes, in a cultivated field, 1,950 feet east and 1,850 feet south of the northwest corner of sec. 32, T. 100 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 27 minutes, and 51 seconds N. and longitude 43 degrees, 26 minutes, and 14 seconds W.

Ap—0 to 11 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.

A—11 to 18 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.

AB—18 to 22 inches; mixed black (10YR 2/1), very dark gray (10YR 3/1), and dark grayish brown (10YR 4/2) silt loam, dark gray (10YR 4/1), gray (10YR 5/1), and grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Btg1—22 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; friable; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; very patchy silt coatings on faces of peds; few very fine roots; slightly acid; gradual smooth boundary.

Btg2—30 to 38 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct strong brown (7.5YR 4/6 and 5/6) mottles; moderate medium and fine prismatic structure parting to moderate medium and fine angular blocky; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few fine roots; slightly acid; clear smooth boundary.

BCg—38 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) and common medium prominent dark brown and brown (7.5YR 4/4) mottles; moderate medium prismatic structure; friable; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; very patchy light gray (10YR 7/1 dry) silt coatings; few fine and few very fine roots; slightly acid; clear smooth boundary.

Cg—46 to 60 inches; mottled grayish brown (2.5Y 5/2),

yellowish brown (10YR 5/6), strong brown (7.5YR 4/6), and dark grayish brown (2.5Y 4/2) silt loam; massive; friable; few fine and few very fine roots; common very dark brown (10YR 2/2), soft accumulations of iron and manganese; slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Btg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam or silt loam

BC horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—silt loam

826—Rowley silt loam, 0 to 2 percent slopes

Composition

Rowley and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Flooding: None
Depth to the water table: 1 to 3 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches (high)
Organic matter content in the surface layer: About 4.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Richwood and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sattre Series

Drainage class: Well drained
Permeability: Moderate in the upper part, very rapid in the lower part
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads
Parent material: Loamy alluvium over sand and gravel
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 1 to 5 percent

Typical Pedon

Sattre loam, 1 to 5 percent slopes, in a cultivated field, 2,150 feet west and 1,000 feet north of the southeast corner of sec. 10, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 18 minutes, and 1 second N. and longitude 43 degrees, 29 minutes, and 17 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; dark yellowish brown (10YR 4/4) streaks and pockets (less than 5 percent); weak fine and very fine subangular blocky structure; friable; few very fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 22 inches; dark yellowish brown (10YR 4/4) loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; thin continuous brown and dark brown (10YR 4/3) clay films on faces of peds; few very fine roots; neutral; gradual smooth boundary.

Bt2—22 to 31 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; few very fine roots;

neutral; clear smooth boundary.

2C1—31 to 39 inches; dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) loamy sand; massive; friable; few very fine roots; neutral; abrupt smooth boundary.

2C2—39 to 41 inches; brown and dark brown (7.5YR 4/4) sandy loam; massive; friable; neutral; abrupt smooth boundary.

2C3—41 to 49 inches; stratified dark yellowish brown (10YR 4/6) and brown and dark brown (7.5YR 4/4) loamy sand; massive; friable; neutral; clear smooth boundary.

2C4—49 to 54 inches; light yellowish brown (10YR 6/4) sand; single grained; loose; 2 percent fine gravel; neutral; abrupt wavy boundary.

2C5—54 to 60 inches; light yellowish brown (10YR 6/4) gravelly sand (about 25 percent gravel); single grained; loose; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Depth to sand, gravel, or both: 30 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bt horizon:
Hue—10YR or 7.5YR
Value—4
Chroma—3 or 4
Texture—loam or sandy clay loam

2C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 to 6
Texture—sand, gravelly sand, gravelly loamy sand, or sandy loam

778B—Sattre loam, 1 to 5 percent slopes

Composition

Sattre and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Terraces
Slope: 1 to 5 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy alluvium over sand and gravel
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.4 inches (moderate)
Organic matter content in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Waukee and similar soils
- Soils that have a surface layer of sandy loam or loamy sand

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Shullsburg Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landscape: Uplands
Landform: Hills
Geomorphic component: Side slopes
Hillslope position: Shoulders and back slopes
Parent material: Loess over shale bedrock
Native vegetation: Prairie grasses and open forest
Slope range: 3 to 9 percent

Typical Pedon

Shullsburg silty clay loam, 3 to 9 percent slopes, in a cultivated field, 1,590 feet north and 1,350 feet east of the southwest corner of sec. 36, T. 99 N., R. 6 W.; U.S.G.S. Hanover, Iowa, Topographic Quadrangle; latitude 91 degrees, 30 minutes, and 20 seconds N. and longitude 43 degrees, 20 minutes, and 47 seconds W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

A—10 to 13 inches; mixed very dark gray (10YR 3/1)

and very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) and grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Btg1—13 to 18 inches; dark grayish brown (2.5Y 4/3 and 4/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; continuous very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) clay films on faces of peds; few very fine roots; few fine black (10YR 2/1) accumulations; neutral; gradual smooth boundary.

Btg2—18 to 25 inches; dark grayish brown (2.5Y 4/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; friable; discontinuous very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) clay films on faces of peds; few very fine roots; few fine black (10YR 2/1) accumulations; neutral; gradual smooth boundary.

Btg3—25 to 29 inches; dark grayish brown (2.5Y 4/3) and olive brown (2.5Y 4/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; discontinuous very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) clay films on faces of peds; few very fine roots; few black (10YR 2/1) accumulations; neutral; clear smooth boundary.

2BCg—29 to 32 inches; dark grayish brown (2.5Y 4/3) and olive brown (2.5Y 4/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) clay accumulation at the contact of the shale; neutral; abrupt wavy boundary.

2Cr—32 inches; mottled greenish gray (5GY 6/1 and 5G 6/1) and yellowish brown (10YR 5/8 and 5/6) shale; massive; very firm.

Range in Characteristics

Depth to bedrock: 20 to 40 inches
Thickness of the mollic epipedon: 10 to 18 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

Btg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam or silt loam

BC horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—2 to 6
Texture—silty clay loam or silt loam

206C—Shullsburg silty clay loam, 3 to 9 percent slopes

Composition

Shullsburg and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Head slopes, nose slopes, and side slopes
Slope: 3 to 9 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: 20 to 40 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Loess over weathered shale
Flooding: None
Seasonal high water table: Perched at a depth of 1 to 3 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches (high)
Organic matter content in the surface layer: About 4.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Massbach and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

Sparta Series

Drainage class: Excessively drained
Permeability: Rapid

Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads and risers
Parent material: Eolian sand
Native vegetation: Prairie grasses
Slope range: 2 to 14 percent

Typical Pedon

Sparta sand, 2 to 5 percent slopes, in a cultivated field, 2,400 feet north and 1,540 feet west of the southeast corner of sec. 28, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 21 minutes, and 0 seconds N. and longitude 43 degrees, 26 minutes, and 55 seconds W.

Ap—0 to 10 inches; very dark brown (10YR 2/2) sand, dark grayish brown (10YR 4/2) dry; weak fine and very fine subangular blocky structure; very friable; common fine and few very fine roots; neutral; clear smooth boundary.

A—10 to 23 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; very friable; few very fine roots; neutral; gradual smooth boundary.

Bw1—23 to 29 inches; brown (10YR 4/3) sand; thin continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; very friable; few very fine roots; neutral; clear smooth boundary.

Bw2—29 to 38 inches; dark yellowish brown (10YR 4/4) sand; weak medium and fine subangular blocky structure; very friable; few very fine roots; slightly acid; clear smooth boundary.

C1—38 to 46 inches; yellowish brown (10YR 5/4) sand; dark yellowish brown (10YR 3/6) lamellae of loamy sand 3 to 5 millimeters thick; single grained; loose; few very fine roots; slightly acid; clear smooth boundary.

C2—46 to 60 inches; yellowish brown (10YR 5/6) sand; dark yellowish brown (10YR 4/4) lamellae of loamy sand 1 to 2 millimeters thick; single grained; loose; few very fine roots; slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Content of coarse sand in the solum: 10 to 15 percent

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand or sand

Bw horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—loamy sand or sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand

41B—Sparta sand, 2 to 5 percent slopes

Composition

Sparta and similar soils: 100 percent

Setting

Landform: Terraces
Slope: 2 to 5 percent

Component Description

Surface layer texture: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches (low)
Organic matter content in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

41C—Sparta sand, 5 to 9 percent slopes

Composition

Sparta and similar soils: 100 percent

Setting

Landform: Terraces
Slope: 5 to 9 percent

Component Description

Surface layer texture: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

41D—Sparta sand, 9 to 14 percent slopes

Composition

Sparta and similar soils: 100 percent

Setting

Landform: Terraces
Slope: 9 to 14 percent

Component Description

Surface layer texture: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches (low)
Organic matter content in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

140B—Sparta loamy sand, 2 to 5 percent slopes

Composition

Sparta and similar soils: 100 percent

Setting

Landform: Terraces
Slope: 2 to 5 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches (low)
Organic matter content in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

140C—Sparta loamy sand, 5 to 9 percent slopes

Composition

Sparta and similar soils: 100 percent

Setting

Landform: Terraces
Slope: 5 to 9 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sand
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches (low)
Organic matter content in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Spillville Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform: Flood plains
Parent material: Local alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 2 percent

Typical Pedon

Spillville loam, 0 to 2 percent slopes, in a cultivated field, 1,150 feet west and 2,100 feet south of the northeast corner of sec. 8, T. 99 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 29 seconds N. and longitude 43 degrees, 24 minutes, and 30 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; few very fine roots; slightly acid; clear smooth boundary.

A1—9 to 14 inches; black (10YR 2/1) and very dark grayish brown (10YR 3/2) loam, very dark gray (10YR 3/1) and grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

A2—14 to 20 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

A3—20 to 34 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

A4—34 to 40 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

AB—40 to 47 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

Bw—47 to 56 inches; dark grayish brown (10YR 4/2) loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

C—56 to 60 inches; dark grayish brown (10YR 4/2) sandy clay loam; dark brown (10YR 3/3) coatings on faces of peds; massive; friable; about 5 percent gravel; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 50 to more than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the mollic epipedon: Greater than 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bw horizon:
Hue—10YR
Value—4
Chroma—2
Texture—loam

C horizon:
Hue—10YR
Value—4
Chroma—2 or 3
Texture—loam or sandy clay loam

485—Spillville loam, 0 to 2 percent slopes

Composition

Spillville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Dominant parent material: Local alluvium
Flooding: Occasional
Depth to the water table: 3 to 5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches (high)
Organic matter content in the surface layer: About 4.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soil that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Tama Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills
Geomorphic component: Divides, interfluves, side slopes, and head slopes
Hillslope position: Summits, shoulders, and back slopes
Parent material: Loess
Native vegetation: Prairie grasses
Slope range: 2 to 9 percent

Typical Pedon

Tama silt loam, 2 to 5 percent slopes, in a cultivated field, 200 feet east and 2,300 feet south of the northwest corner of sec. 1, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 30 minutes, and 23 seconds N. and longitude 43 degrees, 14 minutes, and 56 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine, few fine, and few medium roots; neutral; clear smooth boundary.

A—7 to 11 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure parting to weak fine granular; friable; few very fine, few fine, and few medium roots; neutral; clear smooth boundary.

AB—11 to 18 inches; very dark grayish brown (10YR 3/2) silt loam; dark brown (10YR 4/3) mixings; black (10YR 2/1) coatings on faces of peds; weak fine and very fine subangular blocky structure; friable; few very fine, few fine, and few medium roots; neutral; clear smooth boundary.

Bt1—18 to 25 inches; dark brown (10YR 4/3) silty clay loam; very dark gray (10YR 3/1) mixings in the upper part; weak fine and very fine subangular blocky structure; friable; discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—25 to 31 inches; dark brown (10YR 4/3) silty clay loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; few discontinuous dark brown (10YR 3/3) clay films on faces of peds; few very fine and few fine roots; strongly acid; clear smooth boundary.

BC—31 to 44 inches; dark brown (10YR 4/3) silty clay loam; weak medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine and few fine roots; medium acid; clear smooth boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine and medium distinct strong brown (7.5YR 5.6) mottles; massive; friable; few very fine and few fine roots; strongly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the mollic epipedon: 12 to 20 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

AB horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam

120B—Tama silt loam, 2 to 5 percent slopes

Composition

Tama and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.1 inches (high)
Organic matter content in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Downs and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

120C—Tama silt loam, 5 to 9 percent slopes

Composition

Tama and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Summits and back slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.1 inches (high)
Organic matter content in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Downs and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

Village Series

Drainage class: Well drained
Permeability: Moderate in the upper part, slow in the lower part
Landscape: Uplands
Landform: Hills

Geomorphic component: Side slopes and nose slopes
Hillslope position: Shoulders and back slopes
Parent material: Loess over residuum
Native vegetation: Deciduous trees
Slope range: 5 to 25 percent

Typical Pedon

Village silt loam, 9 to 14 percent slopes, moderately eroded, in a cultivated field, 680 feet west and 460 feet south of the northeast corner of sec. 25, T. 100 N., R. 5 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 27 seconds N. and longitude 43 degrees, 27 minutes, and 22 seconds W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; about 5 percent dark yellowish brown (10YR 4/4) streaks and pockets; weak fine subangular blocky structure; friable; many medium roots; neutral; clear wavy boundary.

BE—6 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; many medium roots; neutral; gradual smooth boundary.

Bt1—10 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; common fine roots; slightly acid; gradual smooth boundary.

Bt2—16 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; common fine roots; medium acid; clear smooth boundary.

Bt3—23 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; few fine roots; medium acid; clear smooth boundary.

2Bt4—26 to 31 inches; yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) silty clay loam; strong coarse angular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few discontinuous very dark grayish brown (10YR 3/2) manganese or iron-manganese coatings; few fine roots; 2 percent channers; medium acid; gradual smooth boundary.

2Bt5—31 to 36 inches; brown and dark brown (7.5YR 4/4) clay loam; few fine distinct yellowish red (5YR 5/6) mottles; moderate medium angular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; discontinuous very dark grayish brown (10YR 3/2) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; medium acid; clear smooth boundary.

2Bt6—36 to 44 inches; reddish brown (5YR 4/4) clay; few medium distinct light olive brown (2.5Y 5/3) mottles; weak coarse angular blocky structure parting to weak fine subangular blocky; firm; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; neutral; gradual smooth boundary.

2Bt7—44 to 50 inches; 90 percent reddish brown (5YR 4/4) and 10 percent yellowish red (5YR 5/8) clay and sandy clay; weak coarse prismatic structure; firm; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; neutral; gradual smooth boundary.

2Bt8—50 to 57 inches; 50 percent brown and dark brown (7.5YR 4/4) and 50 percent yellowish brown (10YR 5/8) clay and silty clay loam; weak coarse prismatic structure; firm; thin discontinuous reddish brown (5YR 4/4) clay films on upper surfaces of peds and stones; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; neutral; gradual smooth boundary.

2Bt9—57 to 60 inches; 50 percent brown and dark brown (7.5YR 4/4) and 50 percent brown and dark brown (7.5YR 4/2) sandy clay loam; weak coarse prismatic structure; firm; few discontinuous reddish brown (5YR 4/4) clay bridges between sand grains; 5 to 10 percent sandstone fragments; slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the loess: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 to 4 moist, 6 or more dry
Chroma—2 or 3
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—4 or 5
Chroma—2 to 8
Texture—dominantly clay or silty clay

837C—Village silt loam, 5 to 9 percent slopes

Composition

Village and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a substratum of sandy loam
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

837C2—Village silt loam, 5 to 9 percent slopes, moderately eroded

Composition

Village and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils
- Soils that have a substratum of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

837D—Village silt loam, 9 to 14 percent slopes

Composition

Village and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Soils that have a substratum of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

837D2—Village silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Village and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of uneroded soils
- Soils that have a substratum of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

837E—Village silt loam, 14 to 18 percent slopes

Composition

Village and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Paintcreek and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

837E2—Village silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Village and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Paintcreek and similar soils
- Areas of severely eroded soils
- Areas of uneroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

837F—Village silt loam, 18 to 25 percent slopes

Composition

Village and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Paintcreek and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Volney Series

Drainage class: Somewhat excessively drained
Permeability: Moderately rapid in the upper part, very rapid in the lower part

Landscape: Uplands and flood plains
Landform: Alluvial fans, drainageways, and flood plains
Parent material: Alluvium
Native vegetation: Prairie grasses
Slope range: 0 to 9 percent

Typical Pedon

Volney channery loam, 2 to 5 percent slopes, in a pasture, 1,300 feet west and 150 feet south of the northeast corner of sec. 20, T. 99 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 27 minutes, and 21 seconds N. and longitude 43 degrees, 23 minutes, and 5 seconds W.

A1—0 to 6 inches; black (10YR 2/1) channery loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 20 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A2—6 to 14 inches; black (10YR 2/1) flaggy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 20 percent flags and 10 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A3—14 to 31 inches; black (10YR 2/1) very channery loam, very dark gray (10YR 3/1) dry; weak very fine subangular blocky structure; friable; about 45 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A4—31 to 48 inches; very dark gray (10YR 3/1) very channery loam; discontinuous black (10YR 2/1) coatings on faces of peds; moderate fine subangular blocky structure; friable; about 50 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A5—48 to 60 inches; very dark gray (10YR 3/1) loam; discontinuous black (10YR 2/1) coatings on faces of peds; moderate medium prismatic structure; about 10 percent channers; friable; slight effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to bedrock: Greater than 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—flaggy, channery, or very channery loam

C horizon (if it occurs):
Hue—10YR
Value—2 to 4
Chroma—2 or 3
Texture—channery or very channery loam or silt loam

196B—Volney channery loam, 2 to 5 percent slopes

Composition

Volney and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Drainageways
Slope: 2 to 5 percent

Component Description

Surface layer texture: Channery loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Areas of recent stratified overwash

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

196C—Volney channery loam, 5 to 9 percent slopes

Composition

Volney and similar soils: 100 percent

Setting

Landform: Drainageways
Slope: 5 to 9 percent

Component Description

Surface layer texture: Channery loam
Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Waukee Series

Drainage class: Well drained
Permeability: Moderate in the upper part, very rapid in the lower part
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads
Parent material: Loamy alluvium over sand and gravel
Native vegetation: Prairie grasses
Slope range: 1 to 5 percent

Typical Pedon

Waukee loam, 1 to 5 percent slopes, in a cultivated field, 575 feet north and 1,700 feet east of the southwest corner of sec. 13, T. 97 N., R. 3 W.; U.S.G.S. Harpers Ferry, Iowa, Topographic Quadrangle; latitude 91 degrees, 8 minutes, and 42 seconds N. and longitude 43 degrees, 12 minutes, and 43 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; slightly acid; gradual smooth boundary.

A—9 to 17 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

BA—17 to 22 inches; very dark grayish brown (10YR 3/2) and very dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bw1—22 to 30 inches; dark brown and brown (10YR 4/3) loam; continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium subangular blocky structure; friable; few very fine roots; slightly acid; clear smooth boundary.

Bw2—30 to 33 inches; dark brown and brown (10YR 4/3) sandy clay loam; dark brown (10YR 3/3) coatings on faces of peds; weak fine subangular blocky structure; friable; few very fine roots; slightly acid; clear smooth boundary.

2BC—33 to 36 inches; dark brown and brown (10YR 4/3) and dark yellowish brown (10YR 4/4) gravelly loamy sand (about 20 percent gravel); weak fine subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

2C1—36 to 49 inches; dark yellowish brown (10YR 4/4) very gravelly sand (about 60 percent gravel); single grained; loose; slightly acid; gradual smooth boundary.

2C2—49 to 60 inches; yellowish brown (10YR 5/4) sand (about 10 percent gravel); single grained; loose; slightly acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Depth to sand, gravel, or both: 24 to 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam or sandy clay loam

2BC and 2C horizons:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—gravelly loamy sand, loamy sand, sand, or gravelly sand

178B—Waukee loam, 1 to 5 percent slopes

Composition

Waukee and similar soils: 100 percent

Setting

Landform: Terraces

Slope: 1 to 5 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy alluvium over sand and gravel
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.6 inches (moderate)
Organic matter content in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Worthen Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills and drainageways
Geomorphic component: Base slopes
Hillslope position: Foot slopes
Parent material: Silty local alluvium
Native vegetation: Prairie grasses
Slope range: 2 to 7 percent

Typical Pedon

Worthen silt loam, 2 to 7 percent slopes, in a cultivated field, 240 feet west and 50 feet north of the center of sec. 23, T. 96 N., R. 6 W.; U.S.G.S. Postville, Iowa, Topographic Quadrangle; latitude 91 degrees, 31 minutes, and 9 seconds N. and longitude 43 degrees, 7 minutes, and 5 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; clear smooth boundary.

A1—7 to 15 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; abrupt smooth boundary.

A2—15 to 22 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; clear smooth boundary.

A3—22 to 34 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

BA—34 to 39 inches; mixed brown or dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silt loam; thin discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bw—39 to 48 inches; dark yellowish brown (10YR 4/4) silt loam; thin discontinuous brown or dark brown (10YR 4/3) coatings on faces of peds; weak medium prismatic structure parting to weak medium subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

BC—48 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; thin discontinuous brown or dark brown (10YR 4/3) coatings on faces of peds; few fine distinct light brownish gray (10YR 6/2) and few fine distinct brown or dark brown (7.5YR 4/6) mottles; weak medium prismatic structure; friable; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of the mollic epipedon: 24 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

981B—Worthen silt loam, 2 to 7 percent slopes

Composition

Worthen and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Slope: 2 to 7 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.3 inches (high)
Organic matter content in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Richwood and similar soils
- Soils that have a surface layer of loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Yellowriver Series

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform: Hills
Geomorphic component: Base slopes
Hillslope position: Foot slopes
Parent material: Slope alluvium
Native vegetation: Deciduous trees
Slope range: 9 to 40 percent

Typical Pedon

Yellowriver silt loam, 18 to 25 percent slopes, in a wooded pasture, 1,080 feet west and 700 feet north of the southeast corner of sec. 33, T. 99 N., R. 3 W.; U.S.G.S. Lansing, Iowa, Topographic Quadrangle; latitude 91 degrees, 11 minutes, and 46 seconds N. and longitude 43 degrees, 20 minutes, and 34 seconds W.

A—0 to 5 inches; very dark gray (10YR 3/1) silt loam (32 percent sand), gray (10YR 5/1) dry; moderate medium and fine granular structure; friable; common fine and few medium roots; mildly alkaline; clear smooth boundary.

E—5 to 12 inches; brown (10YR 4/3) silt loam (30 percent sand); weak thin to thick platy structure; friable; few medium and few fine roots; mildly alkaline; clear smooth boundary.

BE—12 to 18 inches; dark yellowish brown (10YR 4/4) silt loam (18 percent sand); weak medium and fine subangular blocky structure; friable; faint very pale brown (10YR 7/3 dry) silt coatings on faces of peds; few fine roots; mildly alkaline; clear smooth boundary.

Bt1—18 to 26 inches; dark yellowish brown (10YR 4/4) silt loam (13 percent sand); weak medium and fine subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay films on faces of peds; faint very pale brown (10YR 7/3 dry) silt coatings on faces of peds; few fine roots; mildly alkaline; clear smooth boundary.

2Bt2—26 to 40 inches; dark yellowish brown (10YR 4/4) silt loam (8 percent sand); moderate medium and fine subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay films on faces of peds; faint very pale brown (10YR 7/3 dry) silt coatings on faces of peds; few fine roots; neutral; clear smooth boundary.

2Bt3—40 to 48 inches; yellowish brown (10YR 5/6) silt loam (6 percent sand); weak medium subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine black (10YR 2/1) iron or manganese oxides; few fine roots; neutral; clear smooth boundary.

2C—48 to 60 inches; dark yellowish brown (10YR 4/4) and strong brown (10YR 4/6) silt loam (6 percent sand); massive; friable; few fine black (10YR 2/1) iron or manganese oxides; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Depth to bedrock: Greater than 60 inches
Thickness of loamy sediments: 20 to 48 inches
Percent sand in loamy sediments: 10 to 50 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Ap horizon (if it occurs):
Hue—10YR
Value—4
Chroma—2 or 3
Texture—silt loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or loam

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 to 6
Texture—silt loam

861D—Yellowriver silt loam, 9 to 14 percent slopes

Composition

Yellowriver and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Soils that have a surface layer of sandy loam
- Churchtown and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

861D2—Yellowriver silt loam, 9 to 14 percent slopes, moderately eroded

Composition

Yellowriver and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

861E—Yellowriver silt loam, 14 to 18 percent slopes

Composition

Yellowriver and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Churchtown and similar soils
- Soils that have a substratum of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

861E2—Yellowriver silt loam, 14 to 18 percent slopes, moderately eroded

Composition

Yellowriver and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have bedrock at a depth of less than 60 inches
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

861F—Yellowriver silt loam, 18 to 25 percent slopes

Composition

Yellowriver and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None

Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have bedrock at a depth of less than 60 inches
- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

861G—Yellowriver silt loam, 25 to 40 percent slopes

Composition

Yellowriver and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on landform: Back slopes and foot slopes
Slope: 25 to 40 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a surface layer of sandy loam

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Zwingle Series

Drainage class: Poorly drained
Permeability: Very slow
Landscape: Stream terraces
Landform: Terraces
Geomorphic component: Treads
Parent material: Lacustrine
Native vegetation: Deciduous trees
Slope range: 1 to 9 percent

Typical Pedon

Zwingle silt loam, 1 to 9 percent slopes, in a pasture, 1,240 feet west and 710 feet north of the southeast corner of sec. 30, T. 98 N., R. 2 W.; U.S.G.S. Ferryville, Wisconsin, Topographic Quadrangle—Iowa; latitude 91 degrees, 6 minutes, and 59 seconds N. and longitude 43 degrees, 16 minutes, and 12 seconds W.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, light gray (10YR 6/1) dry; weak fine granular structure; friable; common very fine roots; neutral; clear smooth boundary.

E1—3 to 8 inches; light brownish gray (10YR 6/2) silt loam; weak thin platy structure; friable; many fine black (10YR 2/1) iron or manganese oxides; few very fine roots; slightly acid; clear smooth boundary.

E2—8 to 11 inches; light brownish gray (10YR 6/2) silt loam; weak thin platy structure parting to weak fine subangular blocky; friable; common fine black (10YR 2/1) iron or manganese oxides; few very fine roots; medium acid; clear smooth boundary.

Btg1—11 to 16 inches; pinkish gray (7.5YR 6/2) silty clay loam; moderate fine subangular blocky structure; firm; thin continuous pinkish gray (7.5YR 6/2) clay films on faces of peds; few fine black (10YR 2/1) iron or manganese oxides; few very fine roots; medium acid; clear smooth boundary.

Btg2—16 to 23 inches; pinkish gray (7.5YR 6/2) clay; moderate medium subangular blocky structure; firm; thin continuous pinkish gray (7.5YR 6/2) clay films on faces of peds; few very fine roots; medium acid; abrupt smooth boundary.

Btg3—23 to 28 inches; reddish brown (5YR 4/3) clay; moderate fine subangular blocky structure; firm; thin continuous brown (7.5YR 4/3) clay films on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Btg4—28 to 35 inches; reddish brown (5YR 4/4) clay; few fine distinct brown (10YR 5/3) mottles; weak fine and medium subangular blocky structure; firm; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; few very fine roots; medium acid; abrupt smooth boundary.

Btg5—35 to 41 inches; brown (7.5YR 4/4) clay; few coarse distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/3) clay films on faces of peds; many fine black (10YR 2/1) iron or manganese oxides in a 1-inch band at the top of the horizon; neutral; abrupt smooth boundary.

C1—41 to 50 inches; light gray (10YR 6/1), stratified silt loam; many medium prominent strong brown (7.5YR 5/6) and few medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; mildly alkaline; abrupt smooth boundary.

C2—50 to 60 inches; mottled brown (7.5YR 4/4) and light gray (10YR 6/1), stratified silt loam and clay; massive; friable; common medium soft masses of lime; strong effervescence, moderately alkaline.

Range in Characteristics

Depth to carbonates: 48 to more than 60 inches
Depth to bedrock: Greater than 60 inches

Ap or A horizon:
Hue—10YR
Value—3 or 4
Chroma—1 or 2
Texture—silt loam

Btg horizon:
Hue—5YR to 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—clay or silty clay

C horizon:
Hue—5YR to 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—silty clay to silt loam

249C—Zwingle silt loam, 1 to 9 percent slopes

Composition

Zwingle and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Terraces
Slope: 1 to 9 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Lacustrine deposits
Flooding: None
Seasonal high water table: Perched at the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 8.2 inches (moderate)
Organic matter content in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a darker surface layer

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

References

American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 1993. Standard classification of soils for engineering purposes. ASTM Standard D 2487.

Clements, John. 1988. Iowa facts.

Iowa Department of Economic Development. 1987. Statistical profile of Iowa.

Jenny, Hans. 1941. Factors of soil formation.

Ruhe, Robert V. 1956. Geomorphic surfaces and the nature of soils. Soil Science 82: 441-445.

Ruhe, Robert V. 1969. Quaternary landscapes in Iowa.

Ruhe, Robert V., and others. 1955. Radiocarbon dates in central Iowa. Journal of Geology 63: 83-92.

Scholtes, W.H., and others. 1958. Soil survey of Allamakee County, Iowa. U.S. Department of Agriculture and Iowa Agricultural Experiment Station.

Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Science Society of America Proceedings 23: 152-156.

Smith, Guy D., and others. 1950. Prairie soils of the Upper Mississippi Valley. Advanced Agronomy 2: 157-205.

United States Department of Agriculture. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture. 1975. Soil taxonomy: A basic system for making and interpreting soil surveys. Soil Conservation Service, U.S. Department of Agriculture Handbook 436.

United States Department of Agriculture. 1993. Soil survey manual. U.S. Department of Agriculture Handbook 18.

Walker, Patrick H. 1966. Postglacial environments in relation to landscape and soils on the Cary Drift, Iowa. Iowa Agriculture and Home Economics Experiment Station Bulletin 549, pages 838-875.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at

least 30 percent of the surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant

periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposits. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a

gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 6 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is

absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or

other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial

material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses. Common in Wisconsin and Minnesota.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Burning an area under conditions of weather and soil moisture and at the time of day that will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or

manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from back slope to summit. The surface is dominantly convex in profile and erosional in orgin.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and

other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly (but not always) occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop,

and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope profile, exhibiting a nearly level surface. A general term for the top, or highest, level of a landform, such as a hill, a mountain, or tableland. It generally refers to a high interfluve area of gentler slope that is flanked by steeper hillslopes, for example, mountain fronts or tableland escarpments.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive, arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and

bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

☆ U.S. GOVERNMENT PRINTING OFFICE . 1998—432-697/60529/NRCS

United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Allamakee County, Iowa

Part II

How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, which is the color map preceding the detailed soil maps, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1984-89. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. It is part of the technical assistance furnished to the Allamakee County Soil and Water Conservation District. Funds appropriated by Allamakee County were used to defray part of the cost of the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An area of the Fayette-Nordness-Dubuque association in Allamakee County. Strips of corn, oats, and hay planted on the contour help to control erosion in these gently rolling to hilly areas.

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41C—Sparta sand, 5 to 9 percent slopes
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63B—Chelsea loamy sand, 2 to 5 percent slopes
63C—Chelsea loamy sand, 5 to 9 percent slopes
63D—Chelsea loamy sand, 9 to 14 percent slopes
63E—Chelsea loamy sand, 14 to 18 percent slopes
63F—Chelsea loamy sand, 18 to 25 percent slopes
63G—Chelsea loamy sand, 25 to 45 percent slopes
85—Eitzen silt loam, 0 to 2 percent slopes
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703D2—Dubuque silt loam, 9 to 14 percent slopes, moderately eroded
703E—Dubuque silt loam, 14 to 18 percent slopes

Summary of Tables

Soil Survey of Allamakee County, Iowa

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allamakee	Mollic Hapludalfs, fine-silty over clayey, mixed, mesic
Arenzville	Typic Udifluvents, coarse-silty, mixed, nonacid, mesic
Atterberry	Udollic Endoaqualfs, fine-silty, mixed, mesic
Bertrand	Typic Hapludalfs, fine-silty, mixed, mesic
Boone	Typic Quartzipsamments, mesic, uncoated
Caneek	Aeric Fluvaquents, fine-silty, mixed (calcareous), mesic
Chaseburg	Typic Udifluvents, coarse-silty, mixed, nonacid, mesic
Chelsea	Argic Udipsamments, mixed, mesic
Churchtown	Mollic Hapludalfs, fine-silty, mixed, mesic
Downs	Mollic Hapludalfs, fine-silty, mixed, mesic
Dubuque	Typic Hapludalfs, fine-silty, mixed, mesic
Eitzen	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Elon	Aquic Udifluvents, coarse-silty, mixed (calcareous), mesic
Fayette	Typic Hapludalfs, fine-silty, mixed, mesic
Festina	Mollic Hapludalfs, fine-silty, mixed, mesic
Frankville	Mollic Hapludalfs, fine-silty, mixed, mesic
Garwin	Typic Haplaquolls, fine-silty, mixed, mesic
Hawick	Entic Hapludolls, sandy, mixed, mesic
Huntsville	Cumulic Hapludolls, fine-silty, mixed, mesic
Ion	Mollic Udiflufents, coarse-silty, mixed (calcareous), mesic
Lacrescent	Typic Hapludolls, loamy-skeletal, mixed, mesic
Lawson	Cumulic Hapludolls, fine-silty, mixed, mesic
Lycurgus	Typic Argiudolls, fine-silty, mixed, mesic
Massbach	Mollic Hapludalfs, fine-silty, mixed, mesic
Medary	Typic Hapludalfs, fine, mixed, mesic
Muscatine	Aquic Hapludolls, fine-silty, mixed, mesic
Nordness	Lithic Hapludalfs, loamy, mixed, mesic
Orion	Aquic Udifluvents, coarse-silty, mixed, nonacid, mesic
Otter	Cumulic Endoaquolls, fine-silty, mixed, mesic
Paintcreek	Typic Hapludalfs, fine, mixed, mesic
Richwood	Typic Argiudolls, fine-silty, mixed, mesic
Rowley	Aquic Argiudolls, fine-silty, mixed, mesic
Sattre	Mollic Hapludalfs, fine-loamy over sandy or sandy-skeletal, mixed, mesic
Shullsburg	Aquic Argiudolls, fine, mixed, mesic
Sparta	Entic Hapludolls, sandy, mixed, mesic
Spillville	Cumulic Hapludolls, fine-loamy, mixed, mesic
Tama	Typic Argiudolls, fine-silty, mixed, mesic
Village	Typic Hapludalfs, fine-silty over clayey, mixed, mesic
Volney	Cumulic Hapludolls, loamy-skeletal, mixed, mesic
Waukee	Typic Hapludolls, fine-loamy over sandy or sandy-skeletal, mixed, mesic
Worthen	Cumulic Hapludolls, fine-silty, mixed, mesic
Yellowriver	Typic Hapludalfs, fine-silty, mixed, mesic
Zwingle	Typic Albaqualfs, fine, montmorillonitic, mesic

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
40D	Fayette silt loam, karst, 2 to 14 percent slopes	1,775	0.4
41B	Sparta sand, 2 to 5 percent slopes	210	*
41C	Sparta sand, 5 to 9 percent slopes	220	*
41D	Sparta sand, 9 to 14 percent slopes	310	*
63B	Chelsea loamy sand, 2 to 5 percent slopes	170	*
63C	Chelsea loamy sand, 5 to 9 percent slopes	400	*
63D	Chelsea loamy sand, 9 to 14 percent slopes	395	*
63E	Chelsea loamy sand, 14 to 18 percent slopes	600	0.1
63F	Chelsea loamy sand, 18 to 25 percent slopes	260	*
63G	Chelsea loamy sand, 25 to 45 percent slopes	1,275	0.3
85	Eitzen silt loam, 0 to 2 percent slopes	5,500	1.3
85B	Eitzen silt loam, 2 to 5 percent slopes	3,980	0.9
98	Huntsville silt loam, 0 to 2 percent slopes	1,045	0.2
98B	Huntsville silt loam, 2 to 5 percent slopes	240	*
118	Garwin silty clay loam, 0 to 2 percent slopes	135	*
119B	Muscatine silt loam, 1 to 4 percent slopes	880	0.2
120B	Tama silt loam, 2 to 5 percent slopes	2,370	0.6
120C	Tama silt loam, 5 to 9 percent slopes	325	*
129B	Arenzville-Chaseburg complex, 1 to 5 percent slopes	1,810	0.4
140B	Sparta loamy sand, 2 to 5 percent slopes	845	0.2
140C	Sparta loamy sand, 5 to 9 percent slopes	270	*
142	Chaseburg silt loam, 0 to 2 percent slopes	585	0.1
162B	Downs silt loam, 2 to 5 percent slopes	15,350	3.6
162B2	Downs silt loam, 2 to 5 percent slopes, moderately eroded	3,150	0.7
162C	Downs silt loam, 5 to 9 percent slopes	8,720	2.1
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded	20,995	5.0
162D	Downs silt loam, 9 to 14 percent slopes	1,525	0.4
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded	8,465	2.0
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded	320	*
163B	Fayette silt loam, 2 to 5 percent slopes	4,175	1.0
163B2	Fayette silt loam, 2 to 5 percent slopes, moderately eroded	1,120	0.3
163C	Fayette silt loam, 5 to 9 percent slopes	2,665	0.6
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	38,390	9.1
163D	Fayette silt loam, 9 to 14 percent slopes	4,525	1.1
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded	41,760	9.9
163E	Fayette silt loam, 14 to 18 percent slopes	3,505	0.8
163E2	Fayette silt loam, 14 to 18 percent slopes, moderately eroded	7,225	1.7
163F	Fayette silt loam, 18 to 25 percent slopes	1,245	0.3
163G	Fayette silt loam, 25 to 40 percent slopes	300	*
178B	Waukee loam, 1 to 5 percent slopes	420	*
196B	Volney channery loam, 2 to 5 percent slopes	1,050	0.2
196C	Volney channery loam, 5 to 9 percent slopes	400	*
206C	Shullsburg silty clay loam, 3 to 9 percent slopes	255	*
210E	Boone loamy sand, 9 to 18 percent slopes	400	*
210F	Boone loamy sand, 18 to 25 percent slopes	595	0.1
210G	Boone loamy sand, 25 to 40 percent slopes	3,325	0.8
249C	Zwingle silt loam, 1 to 9 percent slopes	455	0.1
291	Atterberry silt loam, 1 to 3 percent slopes	270	*
320	Arenzville silt loam, 0 to 2 percent slopes	1,215	0.3
478G	Nordness-Rock outcrop complex, 25 to 60 percent slopes	1,185	0.3
484	Lawson silt loam, 0 to 2 percent slopes	1,570	0.4
485	Spillville loam, 0 to 2 percent slopes	400	*
487B	Otter-Worthen complex, 1 to 4 percent slopes	1,495	0.4
490	Caneek silt loam, 0 to 2 percent slopes	835	0.2
499C	Nordness silt loam, 5 to 9 percent slopes	425	0.1
499D	Nordness silt loam, 9 to 14 percent slopes	910	0.2
499D2	Nordness silt loam, 9 to 14 percent slopes, moderately eroded	710	0.2
499E	Nordness silt loam, 14 to 18 percent slopes	2,855	0.7
499E2	Nordness silt loam, 14 to 18 percent slopes, moderately eroded	695	0.2
499F	Nordness silt loam, 18 to 25 percent slopes	4,650	1.1
499G	Nordness silt loam, 25 to 40 percent slopes	9,435	2.2

See *footnote* at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
589	Otter silt loam, 0 to 2 percent slopes	305	*
703C	Dubuque silt loam, 5 to 9 percent slopes	260	*
703C2	Dubuque silt loam, 5 to 9 percent slopes, moderately eroded	805	0.2
703D	Dubuque silt loam, 9 to 14 percent slopes	2,005	0.5
703D2	Dubuque silt loam, 9 to 14 percent slopes, moderately eroded	5,890	1.4
703E	Dubuque silt loam, 14 to 18 percent slopes	3,045	0.7
703E2	Dubuque silt loam, 14 to 18 percent slopes, moderately eroded	3,230	0.8
703F	Dubuque silt loam, 18 to 25 percent slopes	1,120	0.3
721C	Massbach silt loam, 3 to 9 percent slopes	420	*
721D	Massbach silt loam, 9 to 15 percent slopes,	260	*
740C	Hawick gravelly sand, 2 to 9 percent slopes	240	*
740G	Hawick gravelly sand, 18 to 40 percent slopes	375	*
778B	Sattre loam, 1 to 5 percent slopes	230	*
793B	Bertrand silt loam, 2 to 5 percent slopes	360	*
793C	Bertrand silt loam, 5 to 9 percent slopes	410	*
793D2	Bertrand silt loam, 9 to 14 percent slopes, moderately eroded	170	*
793E	Bertrand silt loam, 14 to 18 percent slopes	180	*
826	Rowley silt loam, 0 to 2 percent slopes	210	*
837C	Village silt loam, 5 to 9 percent slopes	310	*
837C2	Village silt loam, 5 to 9 percent slopes, moderately eroded	890	0.2
837D	Village silt loam, 9 to 14 percent slopes	3,055	0.7
837D2	Village silt loam, 9 to 14 percent slopes, moderately eroded	11,060	2.6
837E	Village silt loam, 14 to 18 percent slopes	6,805	1.6
837E2	Village silt loam, 14 to 18 percent slopes, moderately eroded	6,200	1.5
837F	Village silt loam, 18 to 25 percent slopes	3,150	0.7
838C2	Allamakee silt loam, 5 to 9 percent slopes, moderately eroded	230	*
838D	Allamakee silt loam, 9 to 14 percent slopes	285	*
838D2	Allamakee silt loam, 9 to 14 percent slopes, moderately eroded	1,585	0.4
838E2	Allamakee silt loam, 14 to 18 percent slopes, moderately eroded	390	*
840E	Lacrescent silt loam, 14 to 18 percent slopes	230	*
840F	Lacrescent silt loam, 18 to 25 percent slopes	705	0.2
840G	Lacrescent silt loam, 25 to 70 percent slopes	54,725	13.0
841G	Rock outcrop-Boone complex, 20 to 70 percent slopes	2,975	0.7
843	Elon silt loam, 0 to 2 percent slopes	1,735	0.4
861D	Yellowriver silt loam, 9 to 14 percent slopes	150	*
861D2	Yellowriver silt loam, 9 to 14 percent slopes, moderately eroded	180	*
861E	Yellowriver silt loam, 14 to 18 percent slopes	1,060	0.3
861E2	Yellowriver silt loam, 14 to 18 percent slopes, moderately eroded	335	*
861F	Yellowriver silt loam, 18 to 25 percent slopes	1,575	0.4
861G	Yellowriver silt loam, 25 to 40 percent slopes	840	0.2
862D	Churchtown loam, 9 to 14 percent slopes	330	*
862D2	Churchtown loam, 9 to 14 percent slopes, moderately eroded	385	*
862E	Churchtown loam, 14 to 18 percent slopes	1,945	0.5
862E2	Churchtown loam, 14 to 18 percent slopes, moderately eroded	680	0.2
862F	Churchtown loam, 18 to 25 percent slopes	865	0.2
903C2	Frankville silt loam, 5 to 9 percent slopes, moderately eroded	355	*
903D	Frankville silt loam, 9 to 14 percent slopes	200	*
903D2	Frankville silt loam, 9 to 14 percent slopes, moderately eroded	600	0.1
903E2	Frankville silt loam, 14 to 18 percent slopes, moderately eroded	365	*
912C	Paintcreek silt loam, 5 to 9 percent slopes	200	*
912D	Paintcreek silt loam, 9 to 14 percent slopes	1,705	0.4
912D2	Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded	1,645	0.4
912E	Paintcreek silt loam, 14 to 18 percent slopes	6,015	1.4
912E2	Paintcreek silt loam, 14 to 18 percent slopes, moderately eroded	2,090	0.5
912F	Paintcreek silt loam, 18 to 30 percent slopes	19,680	4.7
930	Orion silt loam, 0 to 2 percent slopes	1,405	0.3
951G	Medary silt loam, 14 to 45 percent slopes	520	0.1
977	Richwood silt loam, 0 to 2 percent slopes	235	*
977B	Richwood silt loam, 2 to 5 percent slopes	235	*
978B	Festina silt loam, 2 to 5 percent slopes	575	0.1
978C	Festina silt loam, 5 to 9 percent slopes	230	*

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
981B	Worthen silt loam, 2 to 7 percent slopes	1,085	0.3
1120D	Lycurgus silt loam, 9 to 14 percent slopes	150	*
1120E	Lycurgus silt loam, 14 to 18 percent slopes	325	*
1120F	Lycurgus silt loam, 18 to 25 percent slopes	165	*
1490	Caneek silt loam, channeled, 0 to 2 percent slopes	10,855	2.6
1496	Arenzville-Volney complex, 0 to 2 percent slopes	1,885	0.4
1496B	Arenzville-Volney complex, 2 to 5 percent slopes	3,880	0.9
1793G	Bertrand-Chelsea complex, 18 to 35 percent slopes	865	0.2
2670	Ion silt loam, 0 to 2 percent slopes	6,560	1.6
5010	Pits, sand and gravel	40	*
5030	Pits, limestone quarries	235	*
5040	Orthents, loamy	425	0.1
	Water	16,900	4.0
	Total	422,200	100.0

* Less than 0.1 percent.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland Management Considerations

The management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table "Cropland Management Considerations." The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water intake rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *wind erosion* and *water erosion.* Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways help to prevent excessive soil loss (fig. II-1).

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the considerations shown in the table cannot be easily overcome. These are *channels, flooding, gullies,* and *ponding.*

Additional considerations are as follows:

Lime content, limited available water capacity, potential poor tilth and compaction, and *restricted permeability.*—These limitations can be minimized by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface crusting.—This limitation retards seedling development after periods of heavy rainfall.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Surface stones.—Stones or boulders on or near the surface can hinder normal tillage unless they are removed.

Salt content.—In areas where this is a limitation, only salt-tolerant crops should be grown.

On irrigated soils the main management concerns are *efficient water use, nutrient management, control of erosion, pest and weed control,* and *timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, it can create drainage problems, raise the water table, and increase soil salinity.

Explanation of Criteria

Acid soil.—The pH is less than 6.1.

Channeled.—The word "channeled" is included in the map unit name.

Figure II-1.—Contour stripcropping in an area of Fayette silt loam, 9 to 14 percent slopes, moderately eroded. Corn is grown in rotation with small grain and hay. Contour stripcropping helps to control water erosion and conserves moisture.

Dense layer.—The bulk density is 1.80 g/cc or greater within the soil profile.

Depth to rock.—The depth to bedrock is less than 40 inches.

Eroded.—The word "eroded" is included in the map unit name.

Excessive permeability.—Permeability is 6 inches per hour or more within the soil profile.

Flooding.—Flooding is occasional or frequent.

Gullied.—The word "gullied" is included in the map unit name.

High organic matter content.—The surface layer has more than 20 percent organic matter.

Lime content.—The pH is 7.4 or more in the surface layer, or the wind erodibility group is 4L.

Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 6 inches or less.

Limited organic matter content.—The content of organic matter is 2 percent or less in the surface layer.

Ponding.—Ponding duration is assigned to the map unit component. The water table is above the surface.

Potential poor tilth and compaction.—The content of clay is 27 percent or more in the surface layer.

Potential for ground-water contamination (by nutrients or pesticides).—Depth to the water table is 4 feet or less, the permeability of any layer is more than 6.0 inches per hour, or the depth to bedrock is less than 60 inches.

Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally flooded or frequently flooded, is subject to ponding, is assigned to hydrologic group C or D and has a slope of more than 2 percent, is assigned to hydrologic group A and has a slope of more than 6 percent, or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.

Restricted permeability.—Permeability is less than 0.06 inch per hour within the soil profile.

Salt content.—The electrical conductivity is 4 or more in the surface layer or 8 or more within a depth of 30 inches.

Slope (equipment limitation).—The slope is more than 15 percent.

Surface crusting.—The content of clay is 27 percent or more and the content of organic matter is 2 percent or less in the surface layer.

Surface rock fragments (equipment limitation).—The terms describing the texture of the surface layer include any rock fragment modifier, except for gravelly, channery, stony, very stony, extremely stony, bouldery, very bouldery, and extremely bouldery.

Surface stones (equipment limitation).—The word "stony" or "bouldery" is included in the map unit name or in the description of the surface layer.

Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.

Water table.—A water table is within 2.5 feet of the surface.

Wind erosion.—The wind erodibility group is 1, 2, 3, or 4L.

Agronomic Considerations

Inherent subsoil fertility levels, in terms of potential plant available phosphorus and potassium, are described in the table "Agronomic Considerations" at the end of this section. Soil tests of the tilled layer are used to determine the most profitable rates of fertilizers for various crops. Nutrient levels in the subsurface layers do influence crop yields, particularly in the drier seasons when the nutrients in the dry tilled layer become temporarily unavailable to plants. The availability of nutrients in the tilled layer and the subsoil influences the relative uptake from the two zones in the soil profile. Fertilizer recommendations based on soil tests of the tilled layer may be adjusted by the average nutrient levels in the subsoil of each soil series. Fertilizer recommendations are adjusted for subsoil nutrient levels. The ratings given in the table are described as follows:

Subsoil phosphorus.—The amount of plant available phosphorus in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 30 to 42 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of *very low* indicates less than 7.5 ppm; *low,* 7.5 to 13.0 ppm; *medium,* 13.0 to 22.5 ppm; and *high,* more than 22.5 ppm.

Subsoil potassium.—The amount of plant available potassium in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 12 to 24 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of *very low minus* indicates less than 25 ppm; *very low plus,* 25 to 50 ppm; *low,* 50 to 79 ppm; *medium,* 79 to 125 ppm; and *high,* more than 125 ppm.

Tilth rating.—This rating is based on clay content, organic matter content, drainage class, sand size, and sand content. A rating of 1 indicates good tilth; 2, fair; 3, poor; and 4, very poor.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils generally are grouped at three levels—capability class, subclass, and unit (USDA, 1961). These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 4. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such

Figure II-2.—A pastured area of Paintcreek silt loam, 18 to 25 percent slopes. Because of the hazard of water erosion, this soil is best suited to permanent pasture.

as grasses and trees (fig. II-2). The severity of the soil limitations affecting crops increases progressively from class 5 to class 7.

Areas in class 8 are generally not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the table "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops and Pasture" at the end of this section.

Corn Suitability Rating (CSR)

The corn suitability rating for each soil is given in the table "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops and Pasture." Corn suitability ratings provide a relative ranking of all soils mapped in the State of Iowa based on their potential to be utilized for the intensive production of row crops. The CSR is an index that can be used to rate the potential production of one soil compared with another over a period of time. The CSR considers average weather conditions and frequency of use of the soil for row crops. Ratings range from 5 for soils that have severe limitations affecting the production of row crops to 100 for soils that have no physical limitations, have minimal slopes, and can be continuously row cropped. The ratings listed in this table assume adequate management, natural weather conditions (no irrigation), artificial drainage where required, and no land leveling or terracing. They also assume that soils in the lower positions on the landscape are not affected by frequent damaging floods. The weighted CSR for a given field can be modified by the occurrence of sandy spots, local deposits, rock and gravel outcrops, field boundaries, and noncrossable drainageways. Even though predicted average yields will change with time, the CSR's are expected to remain relatively constant in relation to one another.

The CSR's in Allamakee County range from 95 for Muscatine silt loam, 1 to 4 percent slopes, to 5 for several map units, including Nordness silt loam, 18 to 25 percent slopes. No ratings are provided for miscellaneous areas because of the variability of properties and use of these areas.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the table "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops and Pasture." In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Interpretations

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in the table "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops and Pasture."

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise

use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table or are subject to flooding may qualify as prime farmland where these limitations are overcome by drainage measures or flood control. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 59,250 acres, or nearly 14 percent of the survey area, meets the requirements for prime farmland.

The map units in the survey area that meet the requirements for prime farmland are listed in the table "Prime Farmland." This list does not constitute a recommendation for a particular land use. On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units."

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices. The factors are listed in the table "Physical Properties of the Soils."

Soil Erodibility (K) Factor

The soil erodibility (K) factor indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance (T) factor is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The table "Windbreaks and Environmental Plantings" shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same.

Group 1 consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and do not have free carbonates in the upper 20 inches.

Group 1K consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and have free carbonates within 20 inches of the surface. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2 consists of poorly drained soils that have been artificially drained and do not have free carbonates in the upper 20 inches. Permeability varies.

Group 2K consists of poorly drained or very poorly drained soils that have been artificially drained and have free carbonates within 20 inches of the surface. Permeability varies. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2H consists of very poorly drained soils that have been artificially drained and have more than 16 inches of organic material. Permeability varies.

Group 2W consists of very poorly drained soils that are subject to ponding and have been artificially drained. It includes soils that have an organic surface layer up to 16 inches thick. Permeability varies.

Group 3 consists of soils that are well drained or moderately well drained and are loamy or silty throughout. Permeability is moderate or moderately slow. These soils do not have free carbonates in the upper 20 inches.

Group 4 consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a silty or loamy surface layer and a clayey subsoil. Permeability is slow or very slow.

Group 4C consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a clayey surface layer and subsoil. Permeability is slow or very slow.

Group 4F consists of soils that are well drained,

moderately well drained, or somewhat poorly drained and have a substratum of dense till. Permeability is slow or very slow.

Group 5 consists of soils that are excessively drained to moderately well drained and have a moderate available water capacity. These soils are dominantly fine sandy loam or sandy loam, but some are sandy in the upper part and loamy in the lower part.

Group 6G consists of excessively drained to moderately well drained soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 6D consists of excessively drained to moderately well drained, loamy soils that have bedrock at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 7 consists of excessively drained to well drained soils that are dominantly loamy fine sand or coarser textured and are shallow to sand or to sand and gravel. These soils have a low available water capacity.

Group 8 consists of excessively drained to well drained, loamy soils that have free carbonates within 20 inches of the surface.

Group 9W consists of soils that are somewhat poorly drained, poorly drained, or very poorly drained and are moderately saline (the electrical conductivity is 8 to 16).

Group 10 consists of soils or miscellaneous land types that generally are not suitable for windbreaks. One or more characteristics, such as soil depth, texture, wetness, available water capacity, or slope, limit the planting, survival, or growth of trees and shrubs.

The windbreak suitability groups assigned to the soils in this survey area are listed in the table "Windbreak Suitability Groups" at the end of this section.

CROPLAND MANAGEMENT CONSIDERATIONS

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Cropland management considerations
40D:	
Fayette	Potential for surface-water contamination Water erosion
41B:	
Sparta	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
41C:	
Sparta	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
41D:	
Sparta	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
63B:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
63C:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
63D:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
63E:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
63F:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
63G:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
85:	
Eitzen	Acid soil Flooding Potential for surface-water contamination
85B:	
Eitzen	Acid soil Flooding Potential for surface-water contamination Water erosion
98:	
Huntsville	Flooding Potential for surface-water contamination
98B:	
Huntsville	Flooding Potential for surface-water contamination Water erosion
118:	
Garwin	Potential for ground-water contamination Potential poor tilth and compaction Water table
119B:	
Muscatine	Potential for ground-water contamination Water erosion Water table
120B:	
Tama	Potential for surface-water contamination Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
120C:	
Tama	Potential for surface-water contamination Water erosion
129B:	
Arenzville	Flooding Potential for surface-water contamination Water erosion
Chaseburg	Flooding Limited organic matter content Potential for surface-water contamination Water erosion
140B:	
Sparta	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
140C:	
Sparta	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
142:	
Chaseburg	Flooding Limited organic matter content Potential for surface-water contamination
162B:	
Downs	Potential for surface-water contamination Water erosion
162B2:	
Downs	Potential for surface-water contamination Previously eroded Water erosion
162C:	
Downs	Potential for surface-water contamination Water erosion
162C2:	
Downs	Potential for surface-water contamination Previously eroded Water erosion
162D:	
Downs	Potential for surface-water contamination Water erosion
162D2:	
Downs	Potential for surface-water contamination Previously eroded Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
162E2:	
Downs	Potential for surface-water contamination Previously eroded Slope Water erosion
163B:	
Fayette	Potential for surface-water contamination Water erosion
163B2:	
Fayette	Acid soil Potential for surface-water contamination Previously eroded Water erosion
163C:	
Fayette	Potential for surface-water contamination Water erosion
163C2:	
Fayette	Acid soil Potential for surface-water contamination Previously eroded Water erosion
163D:	
Fayette	Potential for surface-water contamination Water erosion
163D2:	
Fayette	Acid soil Potential for surface-water contamination Previously eroded Water erosion
163E:	
Fayette	Potential for surface-water contamination Slope Water erosion
163E2:	
Fayette	Acid soil Potential for surface-water contamination Previously eroded Slope Water erosion
163F:	
Fayette	Potential for surface-water contamination Slope Water erosion
163G:	
Fayette	Potential for surface-water contamination Slope Water erosion
178B:	
Waukee	Acid soil Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
196B:	
Volney	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion
196C:	
Volney	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion
206C:	
Shullsburg	Depth to rock Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion Water table
210E:	
Boone	Depth to rock Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
210F:	
Boone	Depth to rock Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
210G:	
Boone	Depth to rock Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
249C:	
Zwingle	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Water table
291:	
Atterberry	Potential for ground-water contamination Water table
320:	
Arenzville	Flooding Potential for surface-water contamination
478G:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
Rock outcrop	Nonsoil material
484:	
Lawson	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
485:	
Spillville	Flooding Potential for ground-water contamination Potential for surface-water contamination
487B:	
Otter	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
Worthen	Potential for surface-water contamination Water erosion
490:	
Caneek	Flooding Lime content Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
499C:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
499D:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
499D2:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Water erosion
499E:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
499E2:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Slope Water erosion
499F:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
499G:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
589:	
Otter	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
703C:	
Dubuque	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
703C2:	
Dubuque	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Water erosion
703D:	
Dubuque	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
703D2:	
Dubuque	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Water erosion
703E:	
Dubuque	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
703E2:	
Dubuque	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Slope Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
703F:	
Dubuque	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
721C:	
Massbach	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
721D:	
Massbach	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
740C:	
Hawick	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination
740G:	
Hawick	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion
778B:	
Sattre	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion
793B:	
Bertrand	Potential for surface-water contamination Water erosion
793C:	
Bertrand	Potential for surface-water contamination Water erosion
793D2:	
Bertrand	Potential for surface-water contamination Previously eroded Water erosion
793E:	
Bertrand	Potential for surface-water contamination Slope Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
826:	
Rowley	Potential for ground-water contamination Water table
837C:	
Village	Acid soil Potential for surface-water contamination Water erosion
837C2:	
Village	Acid soil Potential for surface-water contamination Previously eroded Water erosion
837D:	
Village	Acid soil Potential for surface-water contamination Water erosion
837D2:	
Village	Acid soil Potential for surface-water contamination Previously eroded Water erosion
837E:	
Village	Acid soil Potential for surface-water contamination Slope Water erosion
837E2:	
Village	Acid soil Potential for surface-water contamination Previously eroded Slope Water erosion
837F:	
Village	Acid soil Potential for surface-water contamination Slope Water erosion
838C2:	
Allamakee	Acid soil Potential for surface-water contamination Previously eroded Water erosion
838D:	
Allamakee	Acid soil Potential for surface-water contamination Water erosion
838D2:	
Allamakee	Acid soil Potential for surface-water contamination Previously eroded Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
838E2:	
Allamakee	Acid soil Potential for surface-water contamination Previously eroded Slope Water erosion
840E:	
Lacrescent	Limited available water capacity Potential for surface-water contamination Slope Water erosion
840F:	
Lacrescent	Limited available water capacity Potential for surface-water contamination Slope Water erosion
840G:	
Lacrescent	Limited available water capacity Potential for surface-water contamination Slope Water erosion
841G:	
Rock outcrop	Nonsoil material
Boone	Depth to rock Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
843:	
Elon	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
861D:	
Yellowriver	Potential for surface-water contamination Water erosion
861D2:	
Yellowriver	Potential for surface-water contamination Previously eroded Water erosion
861E:	
Yellowriver	Potential for surface-water contamination Slope Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
861E2:	
Yellowriver	Potential for surface-water contamination Previously eroded Slope Water erosion
861F:	
Yellowriver	Potential for surface-water contamination Slope Water erosion
861G:	
Yellowriver	Potential for surface-water contamination Slope Water erosion
862D:	
Churchtown	Potential for surface-water contamination Water erosion
862D2:	
Churchtown	Potential for surface-water contamination Previously eroded Water erosion
862E:	
Churchtown	Potential for surface-water contamination Slope Water erosion
862E2:	
Churchtown	Potential for surface-water contamination Previously eroded Slope Water erosion
862F:	
Churchtown	Potential for surface-water contamination Slope Water erosion
903C2:	
Frankville	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Water erosion
903D:	
Frankville	Depth to rock Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
903D2:	
Frankville	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Water erosion
903E2:	
Frankville	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Slope Water erosion
912C:	
Paintcreek	Acid soil Potential for surface-water contamination Water erosion
912D:	
Paintcreek	Acid soil Potential for surface-water contamination Water erosion
912D2:	
Paintcreek	Acid soil Potential for surface-water contamination Previously eroded Water erosion
912E:	
Paintcreek	Acid soil Potential for surface-water contamination Slope Water erosion
912E2:	
Paintcreek	Acid soil Potential for surface-water contamination Previously eroded Slope Water erosion
912F:	
Paintcreek	Acid soil Potential for surface-water contamination Slope Water erosion
930:	
Orion	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
951G:	
Medary	Acid soil Potential for surface-water contamination Slope Water erosion
977:	
Richwood	No major limitations or hazards
977B:	
Richwood	Potential for surface-water contamination Water erosion
978B:	
Festina	Acid soil Potential for surface-water contamination Water erosion
978C:	
Festina	Acid soil Potential for surface-water contamination Water erosion
981B:	
Worthen	Potential for surface-water contamination Water erosion
1120D:	
Lycurgus	Potential for surface-water contamination Water erosion
1120E:	
Lycurgus	Potential for surface-water contamination Slope Water erosion
1120F:	
Lycurgus	Potential for surface-water contamination Slope Water erosion
1490:	
Caneek	Channeled Flooding Lime content Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1496:	
Arenzville	Flooding Potential for surface-water contamination
Volney	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1496B:	
Arenzville	Flooding Potential for surface-water contamination Water erosion
Volney	Excessive permeability Flooding Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion
1793G:	
Bertrand	Potential for surface-water contamination Slope Water erosion
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
2670:	
Ion	Flooding Lime content Potential for surface-water contamination Wind erosion
5010, 5030:	
Pits	Nonsoil material
5040:	
Orthents	No data

AGRONOMIC CONSIDERATIONS

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
40D------------------ Fayette	High	Very low plus	Good
41B, 41C, 41D-------- Sparta	Very low	Very low plus	Poor
63B, 63C, 63D, 63E, 63F, 63G------------ Chelsea	Very low	Very low plus	Poor
85, 85B-------------- Eitzen	Very low	Very low minus	Fair
98, 98B-------------- Huntsville	Very low	Very low minus	Good
118------------------ Garwin	Very low	Very low plus	Fair
119B----------------- Muscatine	Low	Very low plus	Good
120B, 120C----------- Tama	Medium	Very low plus	Good
129B----------------- Arenzville-Chaseburg	Low	Very low minus	Fair
140B, 140C----------- Sparta	Very low	Very low plus	Very poor
142------------------ Chaseburg	Low	Very low plus	Fair
162B----------------- Downs	High	Very low plus	Good
162B2---------------- Downs	High	Very low plus	Fair
162C----------------- Downs	High	Very low plus	Good
162C2---------------- Downs	High	Very low plus	Fair
162D----------------- Downs	High	Very low plus	Good
162D2, 162E2--------- Downs	High	Very low plus	Fair
163B----------------- Fayette	High	Very low plus	Good
163B2---------------- Fayette	High	Very low plus	Fair
163C----------------- Fayette	High	Very low plus	Good

AGRONOMIC CONSIDERATIONS--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
163C2----------------- Fayette	High	Very low plus	Fair
163D------------------ Fayette	High	Very low plus	Good
163D2----------------- Fayette	High	Very low plus	Fair
163E------------------ Fayette	High	Very low plus	Good
163E2----------------- Fayette	High	Very low plus	Fair
163F, 163G------------ Fayette	High	Very low plus	Good
178B------------------ Waukee	Low	Very low plus	Good
196B, 196C------------ Volney	Low	Very low plus	Good
206C------------------ Shullsburg	Medium	Very low minus	Good
210E, 210F, 210G------ Boone	Very low	Very low minus	Good
249C------------------ Zwingle	Very low	Very low plus	Good
291------------------- Atterberry	Medium	Very low plus	Good
320------------------- Arenzville	Low	Very low minus	Fair
478G------------------ Nordness-Rock outcrop	Very low	Low	Good
484------------------- Lawson	Low	Low	Good
485------------------- Spillville	Very low	Very low minus	Good
487B------------------ Otter-Worthen	Low	Very low minus	Fair
490------------------- Caneek	Low	Very low minus	Fair
499C, 499D, 499D2----- Nordness	Very low	Low	Fair
499E------------------ Nordness	Very low	Low	Good
499E2, 499F, 499G----- Nordness	Very low	Low	Fair

AGRONOMIC CONSIDERATIONS--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
589 Otter	Low	Low	Fair
703C Dubuque	Medium	Very low plus	Good
703C2 Dubuque	Medium	Very low plus	Fair
703D Dubuque	Medium	Very low plus	Good
703D2 Dubuque	Medium	Very low plus	Fair
703E Dubuque	Medium	Very low plus	Good
703E2 Dubuque	Medium	Very low plus	Fair
703F Dubuque	Medium	Very low plus	Good
721C, 721D Massbach	High	Very low plus	Good
740C Hawick	Very low	Very low minus	Very poor
740G Hawick	Very low	Very low minus	Fair
778B Sattre	Low	Very low minus	Good
793B, 793C Bertrand	High	Very low plus	Good
793D2 Bertrand	High	Very low plus	Fair
793E Bertrand	High	Very low plus	Good
826 Rowley	Low	Very low plus	Good
837C Village	High	Very low plus	Good
837C2 Village	High	Very low plus	Fair
837D Village	High	Very low plus	Good
837D2 Village	High	Very low plus	Fair
837E Village	High	Very low plus	Good

AGRONOMIC CONSIDERATIONS--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
837E2----------------- Village	High	Very low plus	Fair
837F------------------ Village	High	Very low plus	Good
838C2----------------- Allamakee	High	Very low plus	Fair
838D------------------ Allamakee	High	Very low plus	Good
838D2, 838E2---------- Allamakee	High	Very low plus	Fair
840E, 840F, 840G------ Lacrescent	Very low	Very low minus	Fair
841G------------------ Rock outcrop-Boone	Very low	Very low minus	Very poor
843------------------- Elon	Very low	Very low minus	Fair
861D------------------ Yellowriver	High	Very low plus	Good
861D2----------------- Yellowriver	High	Very low plus	Fair
861E------------------ Yellowriver	High	Very low plus	Good
861E2----------------- Yellowriver	High	Very low plus	Fair
861F------------------ Yellowriver	High	Very low plus	Good
861G------------------ Yellowriver	High	Very low plus	Fair
862D------------------ Churchtown	High	Very low plus	Good
862D2, 862E, 862E2---- Churchtown	High	Very low plus	Fair
862F------------------ Churchtown	High	Very low plus	Good
903C2----------------- Frankville	Medium	Very low plus	Fair
903D------------------ Frankville	Medium	Very low plus	Good
903D2, 903E2---------- Frankville	Medium	Very low plus	Fair
912C------------------ Paintcreek	Very low	Very low minus	Good

AGRONOMIC CONSIDERATIONS--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
912D, 912D2---------- Paintcreek	Very low	Very low minus	Fair
912E----------------- Paintcreek	Very low	Very low minus	Good
912E2---------------- Paintcreek	Very low	Very low minus	Fair
912F----------------- Paintcreek	Very low	Very low minus	Good
930------------------ Orion	Low	Very low minus	Good
951G----------------- Medary	Very low	Very low plus	Fair
977, 977B------------ Richwood	Medium	Very low plus	Good
978B, 978C----------- Festina	High	Very low plus	Good
981B----------------- Worthen	Medium	Very low minus	Good
1120D, 1120E, 1120F-- Lycurgus	Medium	Very low plus	Good
1490----------------- Caneek	Low	Very low minus	Fair
1496, 1496B---------- Arenzville-Volney	Low	Very low minus	Fair
1793G---------------- Bertrand-Chelsea	High	Very low minus	Very poor
2670----------------- Ion	Very low	Very low minus	Fair
5010, 5030----------- Pits	---	---	Poor
5040----------------- Orthents	---	---	Poor

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
40D Fayette	7e	5	---	---	---	---	0.5	0.8
41B Sparta	4s	40	77	26	46	3.2	1.9	3.2
41C Sparta	6s	25	---	---	43	3.0	1.8	3.0
41D Sparta	6s	15	---	---	38	2.6	1.5	2.6
63B Chelsea	4s	36	68	23	41	2.9	1.7	2.8
63C Chelsea	4s	21	63	21	38	2.6	1.5	2.6
63D Chelsea	6s	11	---	---	32	2.3	1.3	2.2
63E Chelsea	7s	5	---	---	---	---	0.9	1.5
63F Chelsea	7s	5	---	---	---	---	0.7	1.1
63G Chelsea	7s	5	---	---	---	---	0.5	0.9
85 Eitzen	2w	88	149	50	89	6.3	3.7	6.1
85B Eitzen	2w	83	146	49	88	6.1	3.6	6.0
98 Huntsville	2w	95	162	54	97	6.8	4.0	6.6
98B Huntsville	2e	90	159	53	95	6.7	3.9	6.5

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
118------------------------ Garwin	2w	95	167	56	100	5.0	4.1	6.8
119B----------------------- Muscatine	2e	95	167	56	100	6.7	4.1	6.8
120B----------------------- Tama	2e	95	167	56	100	7.0	4.1	6.8
120C----------------------- Tama	3e	80	162	54	97	6.8	4.0	6.6
129B-----------------------		63	126	42	76	5.3	3.1	5.2
Arenzville-----------------	2w							
Chaseburg------------------	2e							
140B----------------------- Sparta	4s	45	80	27	48	3.4	2.0	3.3
140C----------------------- Sparta	6s	30	---	---	45	3.2	1.8	3.1
142------------------------ Chaseburg	2w	83	135	45	81	5.7	3.3	5.5
162B----------------------- Downs	2e	90	158	53	95	6.6	3.9	6.5
162B2---------------------- Downs	2e	88	154	52	92	6.5	3.8	6.3
162C----------------------- Downs	3e	75	153	51	92	6.4	3.8	6.3
162C2---------------------- Downs	3e	73	149	50	89	6.3	3.7	6.1
162D----------------------- Downs	3e	65	144	48	86	6.0	3.5	5.9
162D2---------------------- Downs	3e	63	140	47	84	5.9	3.4	5.7
162E2---------------------- Downs	4e	53	123	41	74	5.2	3.0	5.0

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
163B----------------------- Fayette	2e	85	149	50	89	6.3	3.7	6.1
163B2---------------------- Fayette	2e	83	145	49	87	6.1	3.6	5.9
163C----------------------- Fayette	3e	70	144	48	86	6.0	3.5	5.9
163C2---------------------- Fayette	3e	68	140	47	84	5.9	3.4	5.7
163D----------------------- Fayette	3e	60	135	45	81	5.7	3.3	5.5
163D2---------------------- Fayette	3e	58	131	44	79	5.5	3.2	5.4
163E----------------------- Fayette	4e	50	118	40	71	5.0	2.9	4.8
163E2---------------------- Fayette	4e	48	114	38	68	4.8	2.8	4.7
163F----------------------- Fayette	6e	30	---	---	---	---	2.7	4.4
163G----------------------- Fayette	7e	20	---	---	---	---	2.5	4.2
178B----------------------- Waukee	2e	74	129	43	77	5.4	3.2	5.3
196B----------------------- Volney	4s	33	---	---	28	2.0	1.2	1.9
196C----------------------- Volney	6s	18	---	---	25	1.8	1.0	1.7
206C----------------------- Shullsburg	3e	45	106	36	64	4.2	2.6	4.3
210E----------------------- Boone	7s	10	---	---	---	---	0.4	0.7

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
210F Boone	7s	5	---	---	---	---	0.3	0.5
210G Boone	7s	5	---	---	---	---	0.3	0.5
249C Zwingle	3e	20	77	26	46	2.3	1.9	3.2
291 Atterberry	2e	95	153	51	92	6.1	3.8	6.3
320 Arenzville	2w	83	135	45	81	5.7	3.3	5.5
478G		5	---	---	---	---	---	---
Nordness	7s							
Rock outcrop	8s							
484 Lawson	2w	90	157	53	94	6.3	3.9	6.4
485 Spillville	2w	92	156	52	94	6.2	3.8	6.4
487B		68	143	46	86	4.3	3.5	5.9
Otter	2w							
Worthen	2e							
490 Caneek	2w	68	120	40	72	3.6	3.0	4.9
499C Nordness	4s	5	---	---	26	1.8	1.1	1.7
499D Nordness	6s	5	---	---	20	1.4	0.8	1.2
499D2 Nordness	6s	5	---	---	18	1.3	0.5	0.8
499E Nordness	7s	5	---	---	---	---	0.5	0.8

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
499E2------------------------ Nordness	7s	5	---	---	---	---	0.4	0.7
499F------------------------- Nordness	7s	5	---	---	---	---	0.3	0.5
499G------------------------- Nordness	7s	5	---	---	---	---	0.3	0.5
589-------------------------- Otter	2w	85	142	48	85	4.3	3.5	5.8
703C------------------------- Dubuque	3e	41	97	32	58	4.1	2.4	4.0
703C2------------------------ Dubuque	3e	36	93	31	56	3.9	2.3	3.8
703D------------------------- Dubuque	4e	26	88	29	53	3.7	2.2	3.6
703D2------------------------ Dubuque	4e	21	84	28	50	3.5	2.1	3.4
703E------------------------- Dubuque	6e	11	---	---	43	3.0	1.7	2.9
703E2------------------------ Dubuque	6e	6	---	---	40	2.8	1.6	2.7
703F------------------------- Dubuque	7e	5	---	---	---	---	1.5	2.5
721C------------------------- Massbach	3e	43	107	36	64	4.3	2.6	4.4
721D------------------------- Massbach	4e	28	98	33	59	3.9	2.4	4.0
740C------------------------- Hawick	4s	5	---	---	21	1.5	0.9	1.4
740G------------------------- Hawick	7s	5	---	---	---	---	0.2	0.3

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
778B------------------------ Sattre	2e	69	120	40	72	5.0	3.0	4.9
793B------------------------ Bertrand	2e	80	141	47	85	5.9	3.5	5.8
793C------------------------ Bertrand	3e	65	136	46	82	5.7	3.3	5.6
793D2----------------------- Bertrand	3e	53	123	41	74	5.2	3.0	5.0
793E------------------------ Bertrand	4e	45	110	37	66	4.6	2.7	4.5
826------------------------- Rowley	2w	95	162	54	97	6.5	4.0	6.6
837C------------------------ Village	3e	48	119	40	71	5.0	2.9	4.9
837C2----------------------- Village	3s	43	115	39	69	4.8	2.8	4.7
837D------------------------ Village	3s	33	110	37	66	4.6	2.7	4.5
837D2----------------------- Village	3e	28	106	36	64	4.5	2.6	4.3
837E------------------------ Village	4e	18	93	31	56	3.9	2.3	3.8
837E2----------------------- Village	4e	13	89	30	53	3.7	2.2	3.6
837F------------------------ Village	6e	5	---	---	---	---	2.0	3.4
838C2----------------------- Allamakee	3e	48	124	42	74	5.2	3.1	5.1
838D------------------------ Allamakee	3e	38	119	40	71	5.0	2.9	4.9

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
838D2 Allamakee	3e	33	115	39	69	4.8	2.8	4.7
838E2 Allamakee	4e	18	98	33	59	4.1	2.4	4.0
840E Lacrescent	6e	5	---	---	---	---	2.0	3.3
840F Lacrescent	7e	5	---	---	---	---	1.8	3.0
840G Lacrescent	7e	5	---	---	---	---	0.5	0.8
841G		5	---	---	---	---	0.2	0.3
Rock outcrop	8s							
Boone	7s							
843 Elon	2w	75	150	50	90	6.0	3.7	6.2
861D Yellowriver	3e	60	135	45	81	5.7	3.3	5.5
861D2 Yellowriver	3e	58	131	44	79	5.5	3.2	5.4
861E Yellowriver	4e	50	118	40	71	5.0	2.9	4.8
861E2 Yellowriver	4e	48	114	38	68	4.8	2.8	4.7
861F Yellowriver	6e	30	---	---	---	---	2.7	4.4
861G Yellowriver	7e	20	---	---	---	---	2.5	4.2
862D Churchtown	3e	65	144	48	86	6.0	3.5	5.9
862D2 Churchtown	3e	63	140	47	84	5.9	3.4	5.7

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
862E: Churchtown	4e	55	127	43	76	5.3	3.1	5.2
862E2: Churchtown	4e	53	123	41	74	5.2	3.0	5.0
862F: Churchtown	6e	35	---	---	---	---	2.9	4.8
903C2: Frankville	3e	43	99	33	59	4.2	2.4	4.1
903D: Frankville	4e	33	94	31	56	3.9	2.3	3.9
903D2: Frankville	4e	28	90	30	54	3.8	2.2	3.7
903E2: Frankville	6e	13	---	---	44	3.1	1.8	3.0
912C: Paintcreek	3e	28	74	25	44	3.1	1.8	3.0
912D: Paintcreek	4e	13	65	22	39	2.7	1.6	2.7
912D2: Paintcreek	4e	8	55	18	33	2.3	1.4	2.3
912E: Paintcreek	6e	10	---	---	29	2.0	1.2	2.0
912E2: Paintcreek	6e	5	---	---	23	1.6	0.9	1.6
912F: Paintcreek	7e	5	---	---	---	---	0.9	1.6
930: Orion	2w	75	128	43	77	5.1	3.1	5.2
951G: Medary	6e	5	---	---	---	---	0.5	0.8

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
977---------------------------- Richwood	1	95	162	54	97	6.8	4.0	6.6
977B--------------------------- Richwood	2e	90	159	53	95	6.7	3.9	6.5
978B--------------------------- Festina	2e	85	150	50	90	6.3	3.7	6.2
978C--------------------------- Festina	3e	70	145	49	87	6.1	3.6	5.9
981B--------------------------- Worthen	2e	75	154	52	92	6.5	3.8	6.3
1120D-------------------------- Lycurgus	3e	70	153	51	92	6.4	3.8	6.3
1120E-------------------------- Lycurgus	4e	60	136	46	82	5.7	3.3	5.6
1120F-------------------------- Lycurgus	7e	40	---	---	---	---	3.1	5.2
1490--------------------------- Caneek	5w	25	---	---	---	---	2.8	4.7
1496---------------------------		30	95	32	57	4.0	2.3	3.8
Arenzville------------------	2w							
Volney----------------------	4s							
1496B--------------------------		25	90	30	54	3.8	2.2	3.7
Arenzville------------------	2w							
Volney----------------------	4s							
1793G--------------------------		5	---	---	---	---	1.2	2.0
Bertrand--------------------	7e							
Chelsea---------------------	7s							
2670--------------------------- Ion	2w	83	145	49	87	6.1	3.5	5.9

See footnotes at end of table.

LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**
5010, 5030. Pits								
5040. Orthents								

* Relative value: The value for corn suitability rating (CSR).

** Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

PRIME FARMLAND

Map symbol	Soil name
85	Eitzen silt loam, 0 to 2 percent slopes
85B	Eitzen silt loam, 2 to 5 percent slopes
98	Huntsville silt loam, 0 to 2 percent slopes
98B	Huntsville silt loam, 2 to 5 percent slopes
118	Garwin silty clay loam, 0 to 2 percent slopes (where drained)
119B	Muscatine silt loam, 1 to 4 percent slopes
120B	Tama silt loam, 2 to 5 percent slopes
129B	Arenzville-Chaseburg complex, 1 to 5 percent slopes
142	Chaseburg silt loam, 0 to 2 percent slopes
162B	Downs silt loam, 2 to 5 percent slopes
162B2	Downs silt loam, 2 to 5 percent slopes, moderately eroded
163B	Fayette silt loam, 2 to 5 percent slopes
163B2	Fayette silt loam, 2 to 5 percent slopes, moderately eroded
178B	Waukee loam, 1 to 5 percent slopes
291	Atterberry silt loam, 1 to 3 percent slopes
320	Arenzville silt loam, 0 to 2 percent slopes
484	Lawson silt loam, 0 to 2 percent slopes
485	Spillville loam, 0 to 2 percent slopes
487B	Otter-Worthen complex, 1 to 4 percent slopes (where drained)
490	Caneek silt loam, 0 to 2 percent slopes (where drained)
589	Otter silt loam, 0 to 2 percent slopes (where drained)
793B	Bertrand silt loam, 2 to 5 percent slopes
826	Rowley silt loam, 0 to 2 percent slopes
843	Elon silt loam, 0 to 2 percent slopes
930	Orion silt loam, 0 to 2 percent slopes (where drained)
977	Richwood silt loam, 0 to 2 percent slopes
977B	Richwood silt loam, 2 to 5 percent slopes
978B	Festina silt loam, 2 to 5 percent slopes
981B	Worthen silt loam, 2 to 7 percent slopes
2670	Ion silt loam, 0 to 2 percent slopes

WINDBREAKS AND ENVIRONMENTAL PLANTINGS

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
40D:					
Fayette	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---
41B, 41C, 41D:					
Sparta	Manyflower cotoneaster.	Amur maple, Siberian peashrub, silky dogwood, gray dogwood, eastern redcedar, lilac, American cranberrybush.	Norway spruce	Jack pine, red pine, eastern white pine.	---
63B, 63C, 63D, 63E, 63F, 63G:					
Chelsea	Siberian peashrub, lilac.	Eastern redcedar	Jack pine, Austrian pine, red pine.	Eastern white pine	---
85, 85B:					
Eitzen	---	Redosier dogwood, lilac.	Amur maple, white spruce, blue spruce, northern whitecedar.	Hackberry, green ash, Austrian pine, eastern white pine.	Silver maple.
98, 98B:					
Huntsville	---	Redosier dogwood, lilac.	Amur maple, white spruce, blue spruce, northern whitecedar.	Hackberry, green ash, Austrian pine, eastern white pine.	Silver maple.
118:					
Garwin	---	Redosier dogwood, American plum.	Amur maple, hackberry, white spruce, tall purple willow, northern whitecedar.	Green ash, golden willow.	Silver maple, eastern cottonwood.
119B:					
Muscatine	---	Redosier dogwood, lilac.	Amur maple, white spruce, blue spruce, northern whitecedar.	Hackberry, green ash, Austrian pine, eastern white pine.	Silver maple.
120B, 120C:					
Tama	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
129B:					
Arenzville	---	Silky dogwood, redosier dogwood, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, red pine, eastern white pine.	---
Chaseburg	---	Silky dogwood, gray dogwood, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, red pine, eastern white pine.	---
140B, 140C:					
Sparta	Manyflower cotoneaster.	Amur maple, Siberian peashrub, silky dogwood, gray dogwood, eastern redcedar, lilac, American cranberrybush.	Norway spruce	Jack pine, red pine, eastern white pine.	---
142:					
Chaseburg	---	Silky dogwood, gray dogwood, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, red pine, eastern white pine.	---
162B, 162B2, 162C, 162C2, 162D, 162D2, 162E2:					
Downs	---	Siberian peashrub, gray dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---
163B, 163B2, 163C, 163C2, 163D, 163D2, 163E, 163E2, 163F, 163G:					
Fayette	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
178B:					
Waukee	Siberian peashrub, lilac.	Hackberry, eastern redcedar, Manchurian crabapple.	Russian-olive, green ash, honeylocust, jack pine, eastern white pine, bur oak.	---	---
206C:					
Shullsburg	---	Siberian peashrub, eastern redcedar, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, Austrian pine, bur oak.	Green ash, eastern white pine.	---
210E, 210F, 210G:					
Boone	Manyflower cotoneaster.	Amur maple, Siberian peashrub, silky dogwood, gray dogwood, eastern redcedar, lilac, American cranberrybush.	Norway spruce	Jack pine, red pine, eastern white pine.	---
249C:					
Zwingle	---	Redosier dogwood, American plum.	Amur maple, hackberry, white spruce, tall purple willow, northern whitecedar.	Green ash, golden willow.	Silver maple, eastern cottonwood.
291:					
Atterberry	---	Silky dogwood, redosier dogwood, lilac.	Amur maple, white spruce, blue spruce, northern whitecedar.	Hackberry, green ash, Austrian pine, eastern white pine.	Silver maple.
320:					
Arenzville	---	Silky dogwood, redosier dogwood, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, red pine, eastern white pine.	---
484:					
Lawson	---	Silky dogwood, redosier dogwood, common ninebark, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, eastern white pine.	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
485: Spillville	---	Redosier dogwood, lilac.	Amur maple, white spruce, blue spruce, northern whitecedar.	Hackberry, green ash, Austrian pine, eastern white pine.	Silver maple.
487B: Otter	---	Redosier dogwood, common ninebark, American plum, northern whitecedar, nannyberry viburnum, American cranberrybush.	Amur maple, hackberry, white spruce.	Green ash	Silver maple, eastern cottonwood.
Worthen	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---
490: Caneek	---	Siberian peashrub, lilac, northern whitecedar.	Hackberry, eastern redcedar, white spruce, bur oak.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
589: Otter	---	Redosier dogwood, common ninebark, American plum, northern whitecedar, nannyberry viburnum, American cranberrybush.	Amur maple, hackberry, white spruce.	Green ash	Silver maple, eastern cottonwood.
703C, 703C2, 703D, 703D2, 703E, 703E2, 703F: Dubuque	Lilac	Siberian peashrub, eastern redcedar.	Hackberry, Russian-olive, green ash, Manchurian crabapple, jack pine, eastern white pine.	Honeysuckle, Siberian elm.	---
721C, 721D: Massbach	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
740C, 740G: Hawick	Siberian peashrub	Honeysuckle, late lilac.	Russian-olive, green ash, thornless honeylocust, eastern redcedar, jack pine, Austrian pine.	Red pine, eastern white pine, Siberian elm.	---
778B: Sattre	Siberian peashrub, lilac.	Hackberry, eastern redcedar, Manchurian crabapple.	Russian-olive, green ash, honeylocust, jack pine, eastern white pine, bur oak.	---	---
793B, 793C, 793D2, 793E: Bertrand	---	Amur maple, gray dogwood, lilac, northern whitecedar, American cranberrybush.	Norway spruce, white spruce, Black Hills spruce.	Red maple, white ash, red pine, eastern white pine.	---
826: Rowley	---	Silky dogwood, redosier dogwood, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, red pine, eastern white pine.	---
837C, 837C2, 837D, 837D2, 837E, 837E2, 837F: Village	Lilac	Siberian peashrub, gray dogwood, eastern redcedar.	Amur maple, hackberry, Russian-olive, green ash, honeylocust, blue spruce, eastern white pine.	---	---
838C2, 838D, 838D2, 838E2: Allamakee	---	Siberian peashrub, gray dogwood, eastern redcedar, lilac.	Amur maple, hackberry, Russian-olive, green ash, blue spruce, eastern white pine.	Honeylocust	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
841G: Rock outcrop.					
Boone	Manyflower cotoneaster.	Amur maple, Siberian peashrub, silky dogwood, gray dogwood, eastern redcedar, lilac, American cranberrybush.	Norway spruce	Jack pine, red pine, eastern white pine.	---
843: Elon	---	Siberian peashrub	Washington hawthorn, green ash, eastern redcedar, Osage-orange, white spruce, northern whitecedar, nannyberry viburnum.	Black willow	Eastern cottonwood.
862D, 862D2, 862E, 862E2, 862F: Churchtown	Eastern redcedar	Siberian peashrub, gray dogwood, lilac.	Amur maple, hackberry, Russian-olive, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---
903C2, 903D, 903D2, 903E2: Frankville	Lilac	Siberian peashrub, eastern redcedar.	Hackberry, Russian-olive, green ash, Manchurian crabapple, eastern white pine.	Honeylocust, Siberian elm.	---
912C, 912D, 912D2, 912E, 912E2, 912F: Paintcreek	Lilac	Siberian peashrub, gray dogwood, eastern redcedar.	Amur maple, hackberry, Russian-olive, green ash, honeylocust, blue spruce, eastern white pine.	---	---
930: Orion	---	Silky dogwood, redosier dogwood, common ninebark, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, eastern white pine.	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
951G: Medary	---	Amur maple, alternateleaf dogwood, silky dogwood, gray dogwood, lilac, northern whitecedar, American cranberrybush.	White spruce	Red maple, white ash, red pine, eastern white pine.	---
977, 977B: Richwood	---	Amur maple, gray dogwood, lilac, northern whitecedar, American cranberrybush.	Norway spruce, white spruce, Black Hills spruce.	Red maple, white ash, red pine, eastern white pine.	---
978B, 978C: Festina	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---
981B: Worthen	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---
1120D, 1120E, 1120F: Lycurgus	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Amur maple, hackberry, Russian-olive, eastern redcedar, blue spruce, northern whitecedar.	Green ash, eastern white pine.	---
1490: Caneek	---	Siberian peashrub, lilac, northern whitecedar.	Hackberry, eastern redcedar, white spruce, bur oak.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
1496, 1496B: Arenzville	---	Silky dogwood, redosier dogwood, lilac, northern whitecedar, nannyberry viburnum, American cranberrybush.	White spruce	Red maple, silver maple, white ash, red pine, eastern white pine.	---
Volney.					

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1793G:					
Bertrand	---	Amur maple, gray dogwood, lilac, northern whitecedar, American cranberrybush.	Norway spruce, white spruce, Black Hills spruce.	Red maple, white ash, red pine, eastern white pine.	---
Chelsea	Siberian peashrub, lilac.	Eastern redcedar	Jack pine, Austrian pine, red pine.	Eastern white pine	---
2670:					
Ion	---	Siberian peashrub, Tatarian honeysuckle, lilac, northern whitecedar.	Hackberry, eastern redcedar, white spruce, bur oak.	Green ash, honeylocust, golden willow.	Eastern cottonwood.

WINDBREAK SUITABILITY GROUPS

(Suitable shrubs and trees with their mature heights are listed in the "Windbreaks and Environmental Plantings" table. Absence of an entry indicates that a windbreak suitability group is not assigned)

Map symbol and soil name	Windbreak suitability group
40D:	
Fayette	3
41B, 41C, 41D:	
Sparta	7
63B, 63C, 63D, 63E, 63F, 63G:	
Chelsea	7
85, 85B:	
Eitzen	1
98, 98B:	
Huntsville	1
118:	
Garwin	2
119B:	
Muscatine	1
120B, 120C:	
Tama	3
129B:	
Arenzville-Chaseburg	1
140B, 140C:	
Sparta	7
142:	
Chaseburg	1
162B, 162B2, 162C, 162C2, 162D, 162D2, 162E2:	
Downs	3
163B, 163B2, 163C, 163C2, 163D, 163D2, 163E, 163E2, 163F, 163G:	
Fayette	3
178B:	
Waukee	6G
196B, 196C:	
Volney	10
206C:	
Shullsburg	4L
210E, 210F, 210G:	
Boone	7
249C:	
Zwingle	2

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
291:	
Atterberry	1
320:	
Arenzville	1
478G:	
Nordness-Rock outcrop	10
484:	
Lawson	1
485:	
Spillville	1
487B:	
Otter	2
Worthen	3
490:	
Caneek	2K
499C, 499D, 499D2, 499E, 499E2, 499F, 499G:	
Nordness	10
589:	
Otter	2
703C, 703C2, 703D, 703D2, 703E, 703E2, 703F:	
Dubuque	6D
721C, 721D:	
Massbach	3
740C, 740G:	
Hawick	7
778B:	
Sattre	6G
793B, 793C, 793D2, 793E:	
Bertrand	3
826:	
Rowley	1
837C, 837C2, 837D, 837D2, 837E, 837E2, 837F:	
Village	4
838C2, 838D, 838D2, 838E2:	
Allamakee	4
840E, 840F, 840G:	
Lacrescent	10

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
841G:	
Rock outcrop.	
Boone	7
843:	
Elon	1K
861D, 861D2, 861E, 861E2, 861F, 861G:	
Yellowriver	3
862D, 862D2, 862E, 862E2, 862F:	
Churchtown	3
903C2, 903D, 903D2, 903E2:	
Frankville	6D
912C, 912D, 912D2, 912E, 912E2, 912F:	
Paintcreek	3
930:	
Orion	1
951G:	
Medary	4
977, 977B:	
Richwood	3
978B, 978C:	
Festina	3
981B:	
Worthen	3
1120D, 1120E, 1120F:	
Lycurgus	3
1490:	
Caneek	2K
1496, 1496B:	
Arenzville	1
Volney	10
1793G:	
Bertrand	3
Chelsea	7
2670:	
Ion	1K

Woodland

The information in the table "Woodland Management and Productivity" at the end of this section can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

In the table, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind.

Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *productivity class.* The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to plant are those that are suitable for commercial wood production.

WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed)

		Management concerns					Potential productivity			
Map symbol and soil name	Ordination symbol	Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	Trees to plant
40D:										
Fayette----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
41B:										
Sparta-----------	6S	Slight	Moderate	Moderate	Slight	Slight	Northern red oak----	47	2	Jack pine, red pine, eastern white pine.
							Jack pine-----------	55	6	
							Red pine------------	---	---	
41C:										
Sparta-----------	6S	Slight	Moderate	Moderate	Slight	Slight	Northern red oak----	47	2	Jack pine, red pine, eastern white pine.
							Jack pine-----------	55	6	
							Red pine------------	---	---	
41D:										
Sparta-----------	6S	Slight	Moderate	Moderate	Slight	Slight	Northern red oak----	47	2	Jack pine, red pine, eastern white pine.
							Jack pine-----------	55	6	
							Red pine------------	---	---	
63B:										
Chelsea----------	5S	Slight	Slight	Moderate	Slight	Moderate	Quaking aspen-------	72	6	Jack pine, red pine, eastern white pine.
							White oak-----------	70	5	
							Northern red oak----	70	5	
							Jack pine-----------	70	7	
							Red pine------------	72	9	
							Eastern white pine--	83	13	
63C:										
Chelsea----------	5S	Slight	Slight	Moderate	Slight	Moderate	Quaking aspen-------	72	6	Jack pine, red pine, eastern white pine.
							White oak-----------	70	5	
							Northern red oak----	70	5	
							Jack pine-----------	70	7	
							Red pine------------	72	9	
							Eastern white pine--	83	13	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
63D:										
Chelsea----------	5S	Slight	Slight	Moderate	Slight	Moderate	Quaking aspen--------	72	6	Jack pine, red pine, eastern white pine.
							White oak------------	70	5	
							Northern red oak----	70	5	
							Jack pine------------	70	7	
							Red pine-------------	72	9	
							Eastern white pine--	83	13	
63E:										
Chelsea----------	5R	Moderate	Severe	Moderate	Slight	Moderate	Quaking aspen--------	72	6	Jack pine, red pine, eastern white pine.
							White oak------------	70	5	
							Northern red oak----	70	5	
							Jack pine------------	70	7	
							Red pine-------------	72	9	
							Eastern white pine--	83	13	
63F:										
Chelsea----------	5R	Moderate	Severe	Moderate	Slight	Moderate	Quaking aspen--------	72	6	Jack pine, red pine, eastern white pine.
							White oak------------	70	5	
							Northern red oak----	70	5	
							Jack pine------------	70	7	
							Red pine-------------	72	9	
							Eastern white pine--	83	13	
63G:										
Chelsea----------	5R	Severe	Severe	Moderate	Slight	Moderate	Quaking aspen--------	72	6	Jack pine, red pine, eastern white pine.
							White oak------------	70	5	
							Northern red oak----	70	5	
							Jack pine------------	70	7	
							Red pine-------------	72	9	
							Eastern white pine--	83	13	
98:										
Huntsville-------	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	65	4	Silver maple, white ash, white spruce, eastern white pine.
							Silver maple---------	---	---	
							White ash------------	---	---	
98B:										
Huntsville-------	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	65	4	Silver maple, white ash, white spruce, eastern white pine.
							Silver maple---------	---	---	
							White ash------------	---	---	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
129B:										
Arenzville	4A	Slight	Slight	Slight	Slight	Severe	Silver maple	---	---	Black walnut, white spruce, red pine, eastern white pine, northern red oak.
							Bur oak	---	---	
							Northern red oak	65	4	
Chaseburg	4A	Slight	Slight	Slight	Slight	Severe	American basswood	---	---	Sugar maple, black walnut, white spruce, red pine, eastern white pine, northern red oak.
							Sugar maple	---	---	
							Northern red oak	65	4	
140B:										
Sparta	6A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	47	2	Jack pine, red pine, eastern white pine.
							Jack pine	57	6	
							Red pine	---	---	
140C:										
Sparta	6A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	47	2	Jack pine, red pine, eastern white pine.
							Jack pine	57	6	
							Red pine	---	---	
142:										
Chaseburg	4A	Slight	Slight	Slight	Slight	Severe	American basswood	---	---	Sugar maple, black walnut, white spruce, red pine, eastern white pine, northern red oak.
							Sugar maple	---	---	
							Northern red oak	65	4	
162B:										
Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
162B2:										
Downs-----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
162C:										
Downs-----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
162C2:										
Downs-----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
162D:										
Downs-----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
162D2:										
Downs-----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
162E2:										
Downs-----------	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns: Erosion hazard	Management concerns: Equip- ment limita- tion	Management concerns: Seedling mortal- ity	Management concerns: Wind- throw hazard	Management concerns: Plant competi- tion	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Produc- tivity class*	Trees to plant
163B:										
Fayette----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak------------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
163B2:										
Fayette----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak------------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
163C:										
Fayette----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak------------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
163C2:										
Fayette----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak------------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
163D:										
Fayette----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak------------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
163D2:										
Fayette----------	4A	Slight	Slight	Slight	Slight	Moderate	White oak------------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
163E:										
Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
163E2:										
Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
163F:										
Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
163G:										
Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
196B:										
Volney	3A	Slight	Slight	Slight	Slight	Moderate	White oak	55	3	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	55	3	
196C:										
Volney	3A	Slight	Slight	Slight	Slight	Moderate	White oak	55	3	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	55	3	
210E:										
Boone	2R	Moderate	Moderate	Moderate	Moderate	Slight	Northern red oak	---	---	Jack pine, red pine.
							Black oak	44	2	
							Jack pine	49	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
210F: Boone	2R	Moderate	Moderate	Moderate	Moderate	Slight	Northern red oak	---	---	Jack pine, red pine.
							Black oak	44	2	
							Jack pine	49	4	
210G: Boone	2R	Moderate	Moderate	Moderate	Moderate	Slight	Northern red oak	---	---	Jack pine, red pine.
							Black oak	44	2	
							Jack pine	49	4	
249C: Zwingle	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple	80	2	Eastern cottonwood.
							Eastern cottonwood	90	7	
291: Atterberry	4A	Slight	Slight	Slight	Slight	Moderate	White ash	---	---	Silver maple, green ash, Norway spruce, red pine, eastern white pine.
							White oak	---	---	
							Northern red oak	65	4	
							Silver maple	---	---	
							Green ash	---	---	
320: Arenzville	4A	Slight	Slight	Slight	Slight	Severe	Silver maple	---	---	Black walnut, white spruce, red pine, eastern white pine, northern red oak.
							Bur oak	---	---	
							Northern red oak	65	4	
478G: Nordness	2R	Severe	Severe	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
Rock outcrop.										
484: Lawson	2A	Slight	Slight	Slight	Slight	Severe	Red maple	---	---	Silver maple, white ash, white spruce.
							Silver maple	70	2	
							White ash	---	---	
487B: Otter	3W	Slight	Severe	Moderate	Moderate	Severe	Silver maple	85	3	Silver maple, white ash, green ash, eastern cottonwood.
							White ash	---	---	

See footnote at end of table.

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
487B:										
Worthen.										
499C:										
Nordness	2D	Slight	Slight	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
499D:										
Nordness	2D	Slight	Slight	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
499D2:										
Nordness	2D	Slight	Slight	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
499E:										
Nordness	2R	Moderate	Moderate	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
499E2:										
Nordness	2R	Moderate	Moderate	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
499F:										
Nordness	2R	Moderate	Moderate	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
499G:										
Nordness	2R	Moderate	Moderate	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
589:										
Otter	3W	Slight	Severe	Moderate	Moderate	Severe	Silver maple	85	3	Silver maple, white ash, green ash, eastern cottonwood.
							White ash	---	---	
703C:										
Dubuque	4D	Slight	Slight	Slight	Moderate	Moderate	White oak	65	4	Black walnut, red pine, eastern white pine.
							Northern red oak	65	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
703C2: Dubuque	4D	Slight	Slight	Slight	Moderate	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, red pine, eastern white pine.
703D: Dubuque	4D	Slight	Slight	Slight	Moderate	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, red pine, eastern white pine.
703D2: Dubuque	4D	Slight	Slight	Slight	Moderate	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, red pine, eastern white pine.
703E: Dubuque	4R	Moderate	Moderate	Slight	Moderate	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, red pine, eastern white pine.
703E2: Dubuque	4R	Moderate	Moderate	Slight	Moderate	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, red pine, eastern white pine.
703F: Dubuque	4R	Moderate	Moderate	Slight	Moderate	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, red pine, eastern white pine.
721C: Massbach	4A	Slight	Slight	Slight	Slight	Slight	White oak Northern red oak	70 ---	4 ---	White ash, red pine, eastern white pine, Scotch pine, white oak, bur oak, northern red oak.

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
721D:										
Massbach	4A	Slight	Slight	Slight	Slight	Slight	White oak	70	4	White ash, red pine, eastern white pine, Scotch pine, white oak, bur oak, northern red oak.
							Northern red oak	---	---	
778B:										
Sattre	4A	Slight	Slight	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
793B:										
Bertrand	5A	Slight	Slight	Slight	Slight	Severe	White ash	---	---	Black walnut, white spruce, red pine, eastern white pine.
							White oak	---	---	
							Bur oak	---	---	
							Northern red oak	70	5	
							Black walnut	---	---	
793C:										
Bertrand	5A	Slight	Slight	Slight	Slight	Severe	White ash	---	---	Black walnut, white spruce, red pine, eastern white pine.
							White oak	---	---	
							Bur oak	---	---	
							Northern red oak	70	5	
							Black walnut	---	---	
793D2:										
Bertrand	5A	Slight	Slight	Slight	Slight	Severe	White ash	---	---	Black walnut, white spruce, red pine, eastern white pine.
							White oak	---	---	
							Bur oak	---	---	
							Northern red oak	70	5	
							Black walnut	---	---	
793E:										
Bertrand	5R	Moderate	Moderate	Slight	Slight	Severe	White ash	---	---	Black walnut, white spruce, red pine, eastern white pine.
							White oak	---	---	
							Bur oak	---	---	
							Northern red oak	70	5	
							Black walnut	---	---	

See footnote at end of table.

Map symbol and soil name	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Wind-throw hazard	Management concerns: Plant competi-tion	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Produc-tivity class*	Trees to plant
826:										
Rowley----------	2A	Slight	Slight	Slight	Slight	Severe	Red maple-----------	---	---	Silver maple,
							American elm--------	---	---	white ash,
							Silver maple--------	70	2	white spruce.
							White ash-----------	---	---	
837C:										
Village---------	4A	Slight	Slight	Slight	Moderate	Slight	White oak-----------	65	4	Black walnut,
							Northern red oak----	65	4	red pine,
										eastern white
										pine.
837C2:										
Village---------	4A	Slight	Slight	Slight	Moderate	Slight	White oak-----------	65	4	Black walnut,
							Northern red oak----	65	4	red pine,
										eastern white
										pine.
837D:										
Village---------	4A	Slight	Slight	Slight	Moderate	Slight	White oak-----------	65	4	Black walnut,
							Northern red oak----	65	4	red pine,
										eastern white
										pine.
837D2:										
Village---------	4A	Slight	Slight	Slight	Moderate	Slight	White oak-----------	65	4	Black walnut,
							Northern red oak----	65	4	red pine,
										eastern white
										pine.
837E:										
Village---------	4R	Moderate	Moderate	Slight	Moderate	Slight	White oak-----------	65	4	Black walnut,
							Northern red oak----	65	4	red pine,
										eastern white
										pine.
837E2:										
Village---------	4R	Moderate	Moderate	Slight	Moderate	Slight	White oak-----------	65	4	Black walnut,
							Northern red oak----	65	4	red pine,
										eastern white
										pine.

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
837F:										
Village----------	4R	Moderate	Moderate	Slight	Moderate	Slight	White oak------------	65	4	Black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
838C2:										
Allamakee--------	4A	Slight	Slight	Slight	Moderate	Slight	White oak------------	65	4	Black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
838D:										
Allamakee--------	4A	Slight	Slight	Slight	Moderate	Slight	White oak------------	65	4	Black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
838D2:										
Allamakee--------	4A	Slight	Slight	Slight	Moderate	Slight	White oak------------	65	4	Black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
838E2:										
Allamakee--------	4R	Moderate	Moderate	Slight	Moderate	Slight	White oak------------	65	4	Black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
840E:										
Lacrescent-------	3R	Moderate	Moderate	Slight	Slight	Moderate	White oak------------	55	3	Red pine, eastern white pine, white oak, northern red oak, American basswood.
							Northern red oak----	59	3	
							American basswood---	62	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordi-nation symbol	Management concerns: Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Plant competi-tion	Potential productivity: Common trees	Site index	Produc-tivity class*	Trees to plant
840F:										
Lacrescent------	3R	Moderate	Moderate	Slight	Slight	Moderate	White oak-----------	55	3	Red pine, eastern white pine, white oak, northern red oak, American basswood.
							Northern red oak----	59	3	
							American basswood---	62	4	
840G:										
Lacrescent------	3R	Severe	Severe	Slight	Slight	Moderate	White oak-----------	55	3	Red pine, eastern white pine, white oak, northern red oak, American basswood.
							Northern red oak----	59	3	
							American basswood---	62	4	
841G:										
Rock outcrop.										
Boone-----------	2R	Severe	Severe	Severe	Moderate	Slight	Northern red oak----	---	---	Jack pine, red pine.
							Black oak-----------	44	2	
							Jack pine-----------	49	4	
843:										
Elon------------	12A	Slight	Slight	Slight	Slight	Slight	Silver maple--------	---	---	Silver maple, green ash, American sycamore, eastern cottonwood.
							American sycamore---	---	---	
							Eastern cottonwood--	115	12	
861D:										
Yellowriver-----	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
861D2:										
Yellowriver-----	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
861E:										
Yellowriver	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
861E2:										
Yellowriver	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
861F:										
Yellowriver	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
861G:										
Yellowriver	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
862D:										
Churchtown	4A	Slight	Slight	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	
862D2:										
Churchtown	4A	Slight	Slight	Slight	Slight	Moderate	White oak	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
862E: Churchtown	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak	65 65	4 4	Sugar maple, black walnut, red pine, eastern white pine.
862E2: Churchtown	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak	65 65	4 4	Sugar maple, black walnut, red pine, eastern white pine.
862F: Churchtown	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak	65 65	4 4	Sugar maple, black walnut, red pine, eastern white pine.
903C2: Frankville	4A	Slight	Slight	Slight	Slight	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, eastern redcedar, red pine, eastern white pine, Douglas-fir, white oak, northern red oak.
903D: Frankville	4A	Slight	Slight	Slight	Slight	Moderate	White oak Northern red oak	65 65	4 4	Black walnut, eastern redcedar, red pine, eastern white pine, Douglas-fir, white oak, northern red oak.

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
903D2: Frankville	4A	Slight	Slight	Slight	Slight	Moderate	White oak	65	4	Black walnut, eastern redcedar, red pine, eastern white pine, Douglas-fir, white oak, northern red oak.
							Northern red oak	65	4	
903E2: Frankville	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	65	4	Black walnut, eastern redcedar, red pine, eastern white pine, Douglas-fir, white oak, northern red oak.
							Northern red oak	65	4	
912C: Paintcreek	4C	Slight	Severe	Slight	Severe	Moderate	White oak	60	4	Black walnut, red pine, eastern white pine.
							Northern red oak	60	4	
912D: Paintcreek	4C	Slight	Severe	Slight	Severe	Moderate	White oak	60	4	Black walnut, red pine, eastern white pine.
							Northern red oak	60	4	
912D2: Paintcreek	4C	Slight	Severe	Slight	Severe	Moderate	White oak	60	4	Black walnut, red pine, eastern white pine.
							Northern red oak	60	4	
912E: Paintcreek	4R	Moderate	Severe	Slight	Severe	Moderate	White oak	60	4	Black walnut, red pine, eastern white pine.
							Northern red oak	60	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
912E2:										
Paintcreek------	4R	Moderate	Severe	Slight	Severe	Moderate	White oak-----------	60	4	Black walnut, red pine, eastern white pine.
							Northern red oak----	60	4	
912F:										
Paintcreek------	4R	Moderate	Severe	Slight	Severe	Moderate	White oak-----------	60	4	Black walnut, red pine, eastern white pine.
							Northern red oak----	60	4	
930:										
Orion-----------	2W	Slight	Moderate	Slight	Slight	Severe	Red maple-----------	---	---	Silver maple, white ash, white spruce, eastern cottonwood.
							Silver maple--------	80	2	
							White ash-----------	---	---	
951G:										
Medary----------	4R	Moderate	Moderate	Moderate	Severe	Severe	Sugar maple---------	---	---	White spruce, red pine, eastern white pine.
							Northern red oak----	65	4	
							American basswood---	---	---	
978B:										
Festina---------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
978C:										
Festina---------	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	65	4	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	65	4	
1496:										
Arenzville------	4A	Slight	Slight	Slight	Slight	Severe	Silver maple--------	---	---	Black walnut, white spruce, red pine, eastern white pine, northern red oak.
							Bur oak-------------	---	---	
							Northern red oak----	65	4	

See footnote at end of table.

WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
1496:										
Volney----------	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	55	3	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	55	3	
1496B:										
Arenzville------	4A	Slight	Slight	Slight	Slight	Severe	Silver maple--------	---	---	Black walnut, white spruce, red pine, eastern white pine, northern red oak.
							Bur oak-------------	---	---	
							Northern red oak----	65	4	
Volney----------	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	55	3	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak----	55	3	
1793G:										
Bertrand--------	5R	Moderate	Moderate	Slight	Slight	Severe	White ash-----------	---	---	Black walnut, white spruce, red pine, eastern white pine.
							White oak-----------	---	---	
							Bur oak-------------	---	---	
							Northern red oak----	70	5	
							Black walnut--------	---	---	
Chelsea---------	5R	Moderate	Severe	Moderate	Slight	Moderate	Quaking aspen-------	72	6	Jack pine, red pine, eastern white pine.
							White oak-----------	70	5	
							Northern red oak----	70	5	
							Jack pine-----------	70	7	
							Red pine------------	72	9	
							Eastern white pine--	83	13	

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

Recreation

The soils of the survey area are rated in the table "Recreational Development" according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high

water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the table "Recreational Development" can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the table "Building Site Development" and interpretations for septic tank absorption fields in the table "Sanitary Facilities."

RECREATIONAL DEVELOPMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
40D: Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
41B: Sparta	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
41C: Sparta	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
41D: Sparta	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
63B: Chelsea	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
63C: Chelsea	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
63D: Chelsea	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
63E: Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
63F: Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
63G: Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
85: Eitzen	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
85B: Eitzen	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: flooding.
98: Huntsville	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
98B:					
Huntsville	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: flooding.
118:					
Garwin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
119B:					
Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
120B:					
Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
120C:					
Tama	Slight	Slight	Severe: slope.	Slight	Slight.
129B:					
Arenzville	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: flooding.
Chaseburg	Severe: flooding.	Slight	Moderate: slope.	Slight	Moderate: flooding.
140B:					
Sparta	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
140C:					
Sparta	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
142:					
Chaseburg	Severe: flooding.	Slight	Slight	Slight	Moderate: flooding.
162B:					
Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
162B2:					
Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
162C:					
Downs	Slight	Slight	Severe: slope.	Slight	Slight.
162C2:					
Downs	Slight	Slight	Severe: slope.	Slight	Slight.
162D:					
Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
162D2: Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
162E2: Downs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163B: Fayette	Slight	Slight	Moderate: slope.	Slight	Slight.
163B2: Fayette	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
163C: Fayette	Slight	Slight	Severe: slope.	Slight	Slight.
163C2: Fayette	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
163D: Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
163D2: Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
163E: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163E2: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
163F: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163G: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
178B: Waukee	Slight	Slight	Moderate: slope.	Slight	Slight.
196B: Volney	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: small stones, flooding.
196C: Volney	Severe: flooding.	Slight	Severe: slope.	Slight	Moderate: small stones, flooding.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
206C:					
Shullsburg------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, depth to rock.
210E:					
Boone-----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----------	Severe: droughty.
210F:					
Boone-----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: droughty, slope.
210G:					
Boone-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
249C:					
Zwingle---------	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
291:					
Atterberry------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
320:					
Arenzville------	Severe: flooding.	Slight-----------	Moderate: flooding.	Slight-----------	Moderate: flooding.
478G:					
Nordness--------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
484:					
Lawson----------	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
485:					
Spillville------	Severe: flooding.	Slight-----------	Moderate: flooding.	Slight-----------	Moderate: flooding.
487B:					
Otter-----------	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Worthen---------	Slight-----------	Slight-----------	Moderate: slope.	Slight-----------	Slight.
490:					
Caneek----------	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
499C:					
Nordness--------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight------------	Severe: depth to rock.
499D:					
Nordness--------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight------------	Severe: depth to rock.
499D2:					
Nordness--------	Severe: percs slowly, depth to rock.	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock, percs slowly.	Severe: erodes easily.	Severe: depth to rock.
499E:					
Nordness--------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
499E2:					
Nordness--------	Severe: slope, percs slowly, depth to rock.	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock, percs slowly.	Severe: erodes easily.	Severe: slope, depth to rock.
499F:					
Nordness--------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
499G:					
Nordness--------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
589:					
Otter-----------	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
703C:					
Dubuque---------	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: depth to rock.
703C2:					
Dubuque---------	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: depth to rock.
703D:					
Dubuque---------	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, depth to rock.
703D2:					
Dubuque---------	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, depth to rock.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
703E:					
Dubuque	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
703E2:					
Dubuque	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
703F:					
Dubuque	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
721C:					
Massbach	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
721D:					
Massbach	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
740C:					
Hawick	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Severe: too sandy.	Severe: droughty.
740G:					
Hawick	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
778B:					
Sattre	Slight	Slight	Moderate: slope.	Slight	Slight.
793B:					
Bertrand	Slight	Slight	Moderate: slope.	Slight	Slight.
793C:					
Bertrand	Slight	Slight	Severe: slope.	Slight	Slight.
793D2:					
Bertrand	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
793E:					
Bertrand	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
826:					
Rowley	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
837C:					
Village	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
837C2:					
Village	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
837D:					
Village---------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
837D2:					
Village---------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
837E:					
Village---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
837E2:					
Village---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
837F:					
Village---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
838C2:					
Allamakee-------	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight------------	Slight.
838D:					
Allamakee-------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight------------	Moderate: slope.
838D2:					
Allamakee-------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight------------	Moderate: slope.
838E2:					
Allamakee-------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
840E:					
Lacrescent------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
840F:					
Lacrescent------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
840G:					
Lacrescent------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
841G:					
Rock outcrop----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
Boone-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
843:					
Elon------------	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight------------	Moderate: flooding.
861D:					
Yellowriver-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
861D2:					
Yellowriver-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
861E:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
861E2:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
861F:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
861G:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
862D:					
Churchtown------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
862D2:					
Churchtown------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
862E:					
Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
862E2:					
Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
862F:					
Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
903C2:					
Frankville------	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: depth to rock.
903D:					
Frankville------	Moderate: slope, percs slowly.	Severe: percs slowly.	Severe: slope.	Slight------------	Moderate: slope, depth to rock.
903D2:					
Frankville------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
903E2:					
Frankville------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
912C:					
Paintcreek------	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
912D:					
Paintcreek------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
912D2:					
Paintcreek------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
912E:					
Paintcreek------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
912E2:					
Paintcreek------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
912F:					
Paintcreek------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
930:					
Orion-----------	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
951G:					
Medary----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
977:					
Richwood--------	Slight-----------	Slight-----------	Slight-----------	Slight-----------	Slight.
977B:					
Richwood--------	Slight-----------	Slight-----------	Moderate: slope.	Slight-----------	Slight.
978B:					
Festina---------	Slight-----------	Slight-----------	Moderate: slope.	Slight-----------	Slight.
978C:					
Festina---------	Slight-----------	Slight-----------	Severe: slope.	Slight-----------	Slight.
981B:					
Worthen---------	Slight-----------	Slight-----------	Moderate: slope.	Slight-----------	Slight.
1120D:					
Lycurgus--------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----------	Moderate: slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1120E:					
Lycurgus--------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1120F:					
Lycurgus--------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1490:					
Caneek----------	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
1496:					
Arenzville------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Volney----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
1496B:					
Arenzville------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Volney----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
1793G:					
Bertrand--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Chelsea---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
2670:					
Ion-------------	Severe: flooding.	Slight------------	Moderate: flooding.	Slight------------	Moderate: flooding.
5010, 5030. Pits					
5040. Orthents					

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Elements of Wildlife Habitat

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples are corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are bromegrass, timothy, orchardgrass, clover, alfalfa, wheatgrass, and birdsfoot trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestems, indiangrass, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are oak, poplar, box elder, birch, maple, green ash, willow, and American elm. Examples of fruit-producing shrubs that are suitable for planting on soils that have good potential for these plants are honeysuckle, American plum, redosier dogwood, chokecherry, highbush cranberry, blackberry, elderberry, gooseberry, raspberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that provide habitat or supply food in the form of browse, seed, or fruit-like cones. Examples are pine, spruce, and redcedar.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of the root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweeds, wild millet, rushes, sedges, bulrushes, arrowhead, waterplantain, cattail, prairie cordgrass, bluejoint grass, asters, and beggarticks.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, ring-necked pheasant, bobwhite quail, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of

hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild turkey, ruffed grouse, thrushes, woodpeckers, owls, tree squirrels, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas, bogs, or flood plains that support water-tolerant plants. The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, kingfishers, muskrats, otter, mink, and beaver.

WILDLIFE HABITAT

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
40D: Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
41B: Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
41C: Sparta	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
41D: Sparta	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
63B: Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
63C: Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
63D: Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
63E: Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
63F: Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
63G: Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
85: Eitzen	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor.
85B: Eitzen	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor.
98: Huntsville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
98B: Huntsville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
118: Garwin	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
119B: Muscatine	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
120B: Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
120C:										
Tama	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
129B:										
Arenzville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Chaseburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
140B:										
Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
140C:										
Sparta	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
142:										
Chaseburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
162B:										
Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162B2:										
Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162C:										
Downs	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
162C2:										
Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162D:										
Downs	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
162D2:										
Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162E2:										
Downs	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163B:										
Fayette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163B2:										
Fayette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163C:										
Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
163C2: Fayette----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163D: Fayette----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163D2: Fayette----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163E: Fayette----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163E2: Fayette----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163F: Fayette----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163G: Fayette----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
178B: Waukee-----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
196B: Volney-----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
196C: Volney-----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
206C: Shullsburg-------	Fair	Good	Fair	Fair	Good	Poor	Very poor.	Fair	Fair	Very poor.
210E: Boone------------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
210F: Boone------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
210G: Boone------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
249C: Zwingle----------	Poor	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
291: Atterberry-------	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
320:										
Arenzville------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
478G:										
Nordness--------	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop----	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
484:										
Lawson----------	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
485:										
Spillville------	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
487B:										
Otter-----------	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Worthen---------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
490:										
Caneek----------	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Poor	Good.
499C:										
Nordness--------	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499D:										
Nordness--------	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499D2:										
Nordness--------	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499E:										
Nordness--------	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499E2:										
Nordness--------	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499F:										
Nordness--------	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499G:										
Nordness--------	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
589:										
Otter-----------	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
703C:										
Dubuque---------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Open-land wild-life	Wood-land wild-life	Wetland wild-life
703C2: Dubuque----------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
703D: Dubuque----------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
703D2: Dubuque----------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
703E: Dubuque----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
703E2: Dubuque----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
703F: Dubuque----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
721C: Massbach---------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
721D: Massbach---------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
740C: Hawick-----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
740G: Hawick-----------	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
778B: Sattre-----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
793B: Bertrand---------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
793C: Bertrand---------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
793D2: Bertrand---------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
793E: Bertrand---------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
826: Rowley	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
837C: Village	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
837C2: Village	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
837D: Village	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
837D2: Village	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
837E: Village	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
837E2: Village	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
837F: Village	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
838C2: Allamakee	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
838D: Allamakee	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
838D2: Allamakee	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
838E2: Allamakee	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
840E: Lacrescent	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
840F: Lacrescent	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
840G: Lacrescent	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
841G:										
Rock outcrop----	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Boone-----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
843:										
Elon------------	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
861D:										
Yellowriver-----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
861D2:										
Yellowriver-----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
861E:										
Yellowriver-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
861E2:										
Yellowriver-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
861F:										
Yellowriver-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
861G:										
Yellowriver-----	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
862D:										
Churchtown------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
862D2:										
Churchtown------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
862E:										
Churchtown------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
862E2:										
Churchtown------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
862F:										
Churchtown------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
903C2:										
Frankville------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
903D:										
Frankville------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life
903D2: Frankville-------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
903E2: Frankville-------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
912C: Paintcreek-------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
912D: Paintcreek-------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
912D2: Paintcreek-------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
912E: Paintcreek-------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
912E2: Paintcreek-------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
912F: Paintcreek-------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
930: Orion------------	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Good.
951G: Medary-----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
977: Richwood---------	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
977B: Richwood---------	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
978B: Festina----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
978C: Festina----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
981B: Worthen----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1120D: Lycurgus---------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1120E:										
Lycurgus	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1120F:										
Lycurgus	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1490:										
Caneek	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Poor	Good.
1496:										
Arenzville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Volney	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
1496B:										
Arenzville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Volney	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
1793G:										
Bertrand	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
2670:										
Ion	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
5010, 5030. Pits										
5040. Orthents										

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

The table "Building Site Development" shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The

ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The table "Sanitary Facilities" shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight, moderate,* or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good, fair,* and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to

minimize seepage and contamination of local ground water.

The table "Sanitary Facilities" gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. The ratings in the table "Sanitary Facilities" are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Construction Materials

The table "Construction Materials" gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the table "Construction Materials," the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table "Construction Materials," only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The table "Water Management" gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table "Water Management," the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff.

Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

BUILDING SITE DEVELOPMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
40D: Fayette	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
41B: Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
41C: Sparta	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty, too sandy.
41D: Sparta	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
63B: Chelsea	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
63C: Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
63D: Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
63E: Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
63F: Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
63G: Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
85: Eitzen	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
85B: Eitzen	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
98: Huntsville	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
98B: Huntsville	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
118: Garwin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
119B: Muscatine	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
120B: Tama	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
120C: Tama	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
129B: Arenzville	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Chaseburg	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
140B: Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
140C: Sparta	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
142: Chaseburg	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
162B:						
Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
162B2:						
Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
162C:						
Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
162C2:						
Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
162D:						
Downs	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
162D2:						
Downs	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
162E2:						
Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
163B:						
Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
163B2:						
Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
163C:						
Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
163C2:						
Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
163D:						
Fayette	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
163D2: Fayette	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
163E: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
163E2: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
163F: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
163G: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
178B: Waukee	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
196B: Volney	Moderate: dense layer, large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, flooding.
196C: Volney	Moderate: dense layer, large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, flooding.
206C: Shullsburg	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness, depth to rock.
210E: Boone	Severe: cutbanks cave.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
210F: Boone	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
210G:						
Boone-----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
249C:						
Zwingle---------	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
291:						
Atterberry------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
320:						
Arenzville------	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
478G:						
Nordness--------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
Rock outcrop----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
484:						
Lawson----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
485:						
Spillville------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
487B:						
Otter-----------	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding.
Worthen---------	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength, frost action.	Slight.
490:						
Caneek----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
499C:						
Nordness--------	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: depth to rock.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
499D:						
Nordness--------	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: depth to rock.
499D2:						
Nordness--------	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: depth to rock.
499E:						
Nordness--------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
499E2:						
Nordness--------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
499F:						
Nordness--------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
499G:						
Nordness--------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
589:						
Otter-----------	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding.
703C:						
Dubuque---------	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength, frost action.	Moderate: depth to rock.
703C2:						
Dubuque---------	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength, frost action.	Moderate: depth to rock.
703D:						
Dubuque---------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, depth to rock.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
703D2: Dubuque----------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, depth to rock.
703E: Dubuque----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
703E2: Dubuque----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
703F: Dubuque----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
721C: Massbach---------	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
721D: Massbach---------	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
740C: Hawick-----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: droughty.
740G: Hawick-----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
778B: Sattre-----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
793B: Bertrand---------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
793C: Bertrand---------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
793D2: Bertrand---------	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
793E:						
Bertrand--------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
826:						
Rowley----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
837C:						
Village---------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
837C2:						
Village---------	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
837D:						
Village---------	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
837D2:						
Village---------	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
837E:						
Village---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
837E2:						
Village---------	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
837F:						
Village---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
838C2:						
Allamakee-------	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
838D:						
Allamakee-------	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
838D2:						
Allamakee-------	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
838E2:						
Allamakee-------	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
840E:						
Lacrescent------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
840F:						
Lacrescent------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
840G:						
Lacrescent------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
841G:						
Rock outcrop----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
Boone-----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
843:						
Elon------------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
861D:						
Yellowriver-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
861D2:						
Yellowriver-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
861E:						
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
861E2:						
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
861F:						
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
861G: Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
862D: Churchtown------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
862D2: Churchtown------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
862E: Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
862E2: Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
862F: Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
903C2: Frankville------	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength, frost action.	Moderate: depth to rock.
903D: Frankville------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, depth to rock.
903D2: Frankville------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, depth to rock.
903E2: Frankville------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
912C: Paintcreek------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
912D:						
Paintcreek------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
912D2:						
Paintcreek------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
912E:						
Paintcreek------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
912E2:						
Paintcreek------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
912F:						
Paintcreek------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
930:						
Orion-----------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
951G:						
Medary----------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
977:						
Richwood--------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
977B:						
Richwood--------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
978B:						
Festina---------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
978C:						
Festina---------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
981B:						
Worthen	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.	Slight.
1120D:						
Lycurgus	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
1120E:						
Lycurgus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
1120F:						
Lycurgus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
1490:						
Caneek	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
1496:						
Arenzville	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
Volney	Moderate: dense layer, large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
1496B:						
Arenzville	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
Volney	Moderate: dense layer, large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
1793G:						
Bertrand	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
2670:						
Ion	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
5010, 5030. Pits						
5040. Orthents						

SANITARY FACILITIES

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
40D:					
Fayette----------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
41B:					
Sparta----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
41C:					
Sparta----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
41D:					
Sparta----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
63B:					
Chelsea---------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
63C:					
Chelsea---------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
63D:					
Chelsea---------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
63E:					
Chelsea---------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
63F:					
Chelsea---------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
63G:					
Chelsea---------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
85:					
Eitzen----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
85B:					
Eitzen	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
98:					
Huntsville	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
98B:					
Huntsville	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
118:					
Garwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
119B:					
Muscatine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
120B:					
Tama	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
120C:					
Tama	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
129B:					
Arenzville	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Chaseburg	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
140B:					
Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
140C:					
Sparta	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
142:					
Chaseburg	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
162B:					
Downs	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
162B2:					
Downs	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
162C: Downs	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
162C2: Downs	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
162D: Downs	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
162D2: Downs	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
162E2: Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
163B: Fayette	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163B2: Fayette	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163C: Fayette	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163C2: Fayette	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163D: Fayette	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
163D2: Fayette	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
163E: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
163E2: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
163F: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
163G:					
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
178B:					
Waukee	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
196B:					
Volney	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones.
196C:					
Volney	Severe: flooding, poor filter.	Severe: seepage, flooding, slope.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones.
206C:					
Shullsburg	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Poor: depth to rock, too clayey, hard to pack.
210E:					
Boone	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, seepage, too sandy.
210F:					
Boone	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, seepage, too sandy.
210G:					
Boone	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, seepage, too sandy.
249C:					
Zwingle	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
291:					
Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
320:					
Arenzville	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
478G:					
Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
478G:					
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
484:					
Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
485:					
Spillville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
487B:					
Otter	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
Worthen	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
490:					
Caneek	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
499C:					
Nordness	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
499D:					
Nordness	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
499D2:					
Nordness	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
499E:					
Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
499E2:					
Nordness	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
499F:					
Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
499G: Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
589: Otter	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
703C: Dubuque	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
703C2: Dubuque	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
703D: Dubuque	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
703D2: Dubuque	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
703E: Dubuque	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
703E2: Dubuque	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
703F: Dubuque	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
721C: Massbach	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock.	Poor: thin layer.
721D: Massbach	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: thin layer.
740C: Hawick	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
740G:					
Hawick	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
778B:					
Sattre	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
793B:					
Bertrand	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
793C:					
Bertrand	Moderate: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
793D2:					
Bertrand	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope, thin layer.
793E:					
Bertrand	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
826:					
Rowley	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
837C:					
Village	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Poor: thin layer.
837C2:					
Village	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
837D:					
Village	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
837D2:					
Village	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
837E:					
Village	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, thin layer.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
837E2:					
Village	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
837F:					
Village	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, thin layer.
838C2:					
Allamakee	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack, large stones.
838D:					
Allamakee	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
838D2:					
Allamakee	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack, large stones.
838E2:					
Allamakee	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, large stones.
840E:					
Lacrescent	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
840F:					
Lacrescent	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
840G:					
Lacrescent	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
841G:					
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
Boone	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, seepage, too sandy.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
843:					
Elon------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
861D:					
Yellowriver-----	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
861D2:					
Yellowriver-----	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
861E:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
861E2:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
861F:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
861G:					
Yellowriver-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
862D:					
Churchtown------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
862D2:					
Churchtown------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
862E:					
Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
862E2:					
Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
862F:					
Churchtown------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
903C2:					
Frankville------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
903D:					
Frankville------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
903D2:					
Frankville------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
903E2:					
Frankville------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
912C:					
Paintcreek------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight------------	Poor: too clayey, hard to pack.
912D:					
Paintcreek------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
912D2:					
Paintcreek------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
912E:					
Paintcreek------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
912E2:					
Paintcreek------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
912F:					
Paintcreek------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
930:					
Orion-----------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
951G:					
Medary----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
977:					
Richwood--------	Slight------------	Severe: seepage.	Severe: seepage.	Slight------------	Fair: too clayey, thin layer.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
977B:					
Richwood	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
978B:					
Festina	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey.
978C:					
Festina	Slight	Severe: slope.	Severe: seepage.	Slight	Fair: too clayey.
981B:					
Worthen	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
1120D:					
Lycurgus	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
1120E:					
Lycurgus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1120F:					
Lycurgus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1490:					
Caneek	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
1496:					
Arenzville	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Volney	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones.
1496B:					
Arenzville	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Volney	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones.
1793G:					
Bertrand	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
Chelsea	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2670:					
Ion--------------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
5010, 5030. Pits					
5040. Orthents					

CONSTRUCTION MATERIALS

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
40D:				
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
41B, 41C, 41D:				
Sparta	Good	Probable	Improbable: too sandy.	Poor: too sandy.
63B, 63C, 63D:				
Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
63E, 63F:				
Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
63G:				
Chelsea	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
85, 85B:				
Eitzen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
98, 98B:				
Huntsville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
118:				
Garwin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
119B:				
Muscatine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
120B, 120C:				
Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
129B:				
Arenzville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Chaseburg	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
140B, 140C:				
Sparta	Good	Probable	Improbable: too sandy.	Poor: too sandy.
142:				
Chaseburg	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
162B, 162B2, 162C, 162C2: Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
162D, 162D2: Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
162E2: Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
163B, 163B2, 163C, 163C2: Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
163D, 163D2: Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
163E, 163E2, 163F: Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
163G: Fayette	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
178B: Waukee	Good	Probable	Probable	Fair: small stones, area reclaim, thin layer.
196B, 196C: Volney	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
206C: Shullsburg	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, thin layer.
210E: Boone	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
210F: Boone	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
210G: Boone	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
249C:				
Zwingle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
291:				
Atterberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
320:				
Arenzville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
478G:				
Nordness	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
484:				
Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
485:				
Spillville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
487B:				
Otter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Worthen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
490:				
Caneek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
499C, 499D, 499D2:				
Nordness	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
499E, 499E2, 499F:				
Nordness	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
499G:				
Nordness	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
589:				
Otter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
703C:				
Dubuque	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
703C2: Dubuque	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey.
703D: Dubuque	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, slope.
703D2: Dubuque	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
703E, 703E2, 703F: Dubuque	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
721C: Massbach	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
721D: Massbach	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer, slope.
740C: Hawick	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
740G: Hawick	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
778B: Sattre	Good	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
793B, 793C: Bertrand	Good	Probable	Improbable: too sandy.	Good.
793D2: Bertrand	Good	Probable	Improbable: too sandy.	Fair: slope.
793E: Bertrand	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
826: Rowley	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too clayey.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
837C: Village	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
837C2: Village	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
837D: Village	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim, slope.
837D2: Village	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
837E, 837E2: 837F: Village	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
838C2: Allamakee	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
838D: Allamakee	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
838D2: Allamakee	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
838E2: Allamakee	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
840E, 840F: Lacrescent	Fair: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
840G: Lacrescent	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
841G:				
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
Boone	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
843:				
Elon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
861D, 861D2:				
Yellowriver	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
861E, 861E2, 861F:				
Yellowriver	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
861G:				
Yellowriver	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
862D, 862D2:				
Churchtown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
862E, 862E2, 862F:				
Churchtown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
903C2:				
Frankville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey.
903D:				
Frankville	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
903D2:				
Frankville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
903E2:				
Frankville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
912C:				
Paintcreek	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
912D, 912D2: Paintcreek	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
912E, 912E2, 912F: Paintcreek	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
930: Orion	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
951G: Medary	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
977, 977B: Richwood	Good	Probable	Improbable: too sandy.	Good.
978B, 978C: Festina	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
981B: Worthen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1120D: Lycurgus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
1120E, 1120F: Lycurgus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1490: Caneek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1496, 1496B: Arenzville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Volney	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
1793G: Bertrand	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
Chelsea	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
2670:				
Ion-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
5010, 5030. Pits				
5040. Orthents				

WATER MANAGEMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
40D: Fayette----------	Severe: slope.	Slight----------	Severe: no water.	Deep to water	Slope-----------	Slope, erodes easily.	Slope, erodes easily.
41B: Sparta-----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
41C: Sparta-----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
41D: Sparta-----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
63B: Chelsea----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
63C: Chelsea----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
63D: Chelsea----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
63E: Chelsea----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
63F: Chelsea----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
63G:							
Chelsea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
85:							
Eitzen	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Flooding	Favorable	Favorable.
85B:							
Eitzen	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, flooding.	Favorable	Favorable.
98:							
Huntsville	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Flooding	Favorable	Favorable.
98B:							
Huntsville	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, flooding.	Favorable	Favorable.
118:							
Garwin	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness	Wetness.
119B:							
Muscatine	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
120B:							
Tama	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
120C:							
Tama	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
129B:							
Arenzville	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, flooding.	Erodes easily	Erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
129B: Chaseburg	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
140B: Sparta	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
140C: Sparta	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
142: Chaseburg	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
162B: Downs	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
162B2: Downs	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
162C: Downs	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
162C2: Downs	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
162D: Downs	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
162D2: Downs	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
162E2: Downs	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
163B: Fayette	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
163B2: Fayette	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
163C: Fayette	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
163C2: Fayette	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
163D: Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
163D2: Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
163E: Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
163E2: Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
163F: Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
163G: Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
178B: Waukee----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, rooting depth.	Too sandy------	Rooting depth.
196B: Volney----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, rooting depth.	Large stones---	Large stones, rooting depth.
196C: Volney----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, rooting depth.	Large stones---	Large stones, rooting depth.
206C: Shullsburg------	Moderate: depth to rock, slope.	Severe: hard to pack	Severe: no water.	Percs slowly, depth to rock, frost action.	Slope, wetness, percs slowly.	Depth to rock, wetness.	Wetness, depth to rock.
210E: Boone-----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
210F: Boone-----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, depth to rock, too sandy	Slope, droughty, depth to rock.
210G: Boone-----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
249C: Zwingle---------	Severe: seepage.	Moderate: thin layer, hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
291: Atterberry------	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
320: Arenzville------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
478G:							
Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
484:							
Lawson	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
485:							
Spillville	Severe: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
487B:							
Otter	Moderate: seepage.	Severe: piping, ponding.	Moderate: slow refill.	Ponding, flooding, frost action.	Ponding, flooding.	Erodes easily, ponding.	Wetness, erodes easily.
Worthen	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
490:							
Caneek	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
499C:							
Nordness	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
499D:							
Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
499D2:							
Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
499E: Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
499E2: Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
499F: Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
499G: Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
589: Otter	Moderate: seepage.	Severe: piping, ponding.	Moderate: slow refill.	Ponding, flooding, frost action.	Ponding, flooding.	Erodes easily, ponding.	Wetness, erodes easily.
703C: Dubuque	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
703C2: Dubuque	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
703D: Dubuque	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
703D2: Dubuque	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
703E: Dubuque	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
703E2: Dubuque	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
703F: Dubuque	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
721C: Massbach	Moderate: seepage, depth to rock, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
721D: Massbach	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
740C: Hawick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
740G: Hawick	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
778B: Sattre	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, rooting depth.	Too sandy	Rooting depth.
793B: Bertrand	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
793C: Bertrand	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
793D2: Bertrand---------	Severe: slope, seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
793E: Bertrand---------	Severe: slope, seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
826: Rowley-----------	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action---	Wetness---------	Erodes easily, wetness.	Wetness, erodes easily.
837C: Village----------	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily	Erodes easily, percs slowly.
837C2: Village----------	Moderate: seepage, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
837D: Village----------	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
837D2: Village----------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
837E: Village----------	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
837E2: Village----------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
837F: Village----------	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily.	Slope, erodes easily, percs slowly.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
838C2: Allamakee-------	Moderate: seepage, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
838D: Allamakee-------	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
838D2: Allamakee-------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
838E2: Allamakee-------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
840E: Lacrescent------	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Severe: no water.	Deep to water	Slope, large stones.	Slope, large stones.	Large stones, slope.
840F: Lacrescent------	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Severe: no water.	Deep to water	Slope, large stones.	Slope, large stones.	Large stones, slope.
840G: Lacrescent------	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Severe: no water.	Deep to water	Slope, large stones.	Slope, large stones.	Large stones, slope.
841G: Rock outcrop----	Severe: depth to rock, slope.	Slight---------	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Boone-----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
843: Elon------------	Moderate: seepage.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Erodes easily.
861D: Yellowriver-----	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
861D2: Yellowriver-----	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
861E: Yellowriver-----	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
861E2: Yellowriver-----	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
861F: Yellowriver-----	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
861G: Yellowriver-----	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
862D: Churchtown------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
862D2: Churchtown------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
862E: Churchtown------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
862E2: Churchtown------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
862F: Churchtown------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
903C2: Frankville------	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
903D: Frankville------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
903D2: Frankville------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
903E2: Frankville------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
912C: Paintcreek------	Moderate: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
912D: Paintcreek------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
912D2: Paintcreek------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
912E: Paintcreek------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
912E2: Paintcreek------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
912F: Paintcreek------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
930: Orion-----------	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
951G: Medary----------	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
977: Richwood--------	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily	Erodes easily.
977B: Richwood--------	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
978B: Festina---------	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
978C: Festina---------	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
981B: Worthen---------	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
1120D: Lycurgus--------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
1120E: Lycurgus--------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1120F:							
Lycurgus	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
1490:							
Caneek	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
1496:							
Arenzville	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
Volney	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, rooting depth.	Large stones	Large stones, rooting depth.
1496B:							
Arenzville	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, flooding.	Erodes easily	Erodes easily.
Volney	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, rooting depth.	Large stones	Large stones, rooting depth.
1793G:							
Bertrand	Severe: slope, seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Chelsea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
2670:							
Ion	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Flooding	Favorable	Favorable.
5010, 5030. Pits							
5040. Orthents							

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by

converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The tables "Physical Properties of the Soils" and "Chemical Properties of the Soils" show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table "Physical Properties of the Soils," the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the

soil at various stages of decomposition. In the table "Physical Properties of the Soils," the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

The *Wind erodibility index* represents the theoretical, long-term amount of soil lost per year as a result of wind erosion. It is based on the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter and is expressed in tons per acre per year.

In the table "Chemical Properties of the Soils," *cation-exchange capacity* is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. It is a measurement of the nutrient-holding capacity of the soil.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate is expressed as a weighted percentage of the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients, such as phosphorus, is affected by the amount of carbonates in the soil.

Water Features

The table "Water Features" gives estimates of several important water features used in land use

planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the intake rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

The table "Water Features" gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means that flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table "Water Features" are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a

saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to the formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to the formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

ENGINEERING INDEX PROPERTIES

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
40D:												
Fayette----------	0-13	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	13-51	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	51-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
41B:												
Sparta-----------	0-23	Sand-----------	SP-SM, SM	A-3, A-2	0	0	85-100	85-100	50-75	5-35	0-14	NP
	23-38	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	0	85-100	85-100	50-95	5-50	0-14	NP
	38-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	0-14	NP
41C:												
Sparta-----------	0-23	Sand-----------	SP-SM, SM	A-3, A-2	0	0	85-100	85-100	50-75	5-35	0-14	NP
	23-38	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	0	85-100	85-100	50-95	5-50	0-14	NP
	38-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	0-14	NP
41D:												
Sparta-----------	0-23	Sand-----------	SP-SM, SM	A-3, A-2	0	0	85-100	85-100	50-75	5-35	0-14	NP
	23-38	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	0	85-100	85-100	50-95	5-50	0-14	NP
	38-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	0-14	NP
63B:												
Chelsea----------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	100	65-80	10-35	0-14	NP
	3-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-80	3-15	0-14	NP
63C:												
Chelsea----------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	100	65-80	10-35	0-14	NP
	3-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-80	3-15	0-14	NP
63D:												
Chelsea----------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	100	65-80	10-35	0-14	NP
	3-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-80	3-15	0-14	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
63E:												
Chelsea---------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	100	65-80	10-35	0-14	NP
	3-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-80	3-15	0-14	NP
63F:												
Chelsea---------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	100	65-80	10-35	0-14	NP
	3-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-80	3-15	0-14	NP
63G:												
Chelsea---------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	100	65-80	10-35	0-14	NP
	3-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-80	3-15	0-14	NP
85:												
Eitzen----------	0-30	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	98-100	92-100	75-100	25-40	5-18
	30-53	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	98-100	92-100	85-95	25-40	5-20
	53-60	Silt loam, loam	CL, CL-ML	A-6, A-4	0	0	100	90-100	85-100	80-95	25-40	5-20
85B:												
Eitzen----------	0-30	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	98-100	92-100	75-100	25-40	5-18
	30-53	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	98-100	92-100	85-95	25-40	5-20
	53-60	Silt loam, loam	CL, CL-ML	A-6, A-4	0	0	100	90-100	85-100	80-95	25-40	5-20
98:												
Huntsville------	0-39	Silt loam------	CL	A-6	0	0	100	95-100	90-100	85-100	25-40	10-20
	39-60	Silt loam------	CL	A-6	0	0	100	95-100	90-100	85-100	20-35	10-20
98B:												
Huntsville------	0-39	Silt loam------	CL	A-6	0	0	100	95-100	90-100	85-100	25-40	10-20
	39-60	Silt loam------	CL	A-6	0	0	100	95-100	90-100	85-100	20-35	10-20
118:												
Garwin----------	0-20	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	45-55	20-30
	20-24	Silty clay loam	CH, CL	A-7	0	0	100	100	100	95-100	45-55	25-35
	24-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
119B:												
Muscatine-------	0-10	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	10-34	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	20-30
	34-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
120B:												
Tama------------	0-18	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	18-44	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	44-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
120C:												
Tama------------	0-18	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	18-44	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	44-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
129B:												
Arenzville------	0-23	Silt loam------	ML, CL-ML, CL	A-4	0	0	100	100	95-100	80-95	20-30	4-10
	23-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-45	10-20
Chaseburg-------	0-18	Silt loam------	ML, CL-ML	A-4	0	0	100	100	90-100	85-100	15-26	3-7
	18-60	Silt loam------	ML, CL-ML, CL	A-4	0	0	85-100	85-100	85-100	85-100	15-28	3-9
140B:												
Sparta----------	0-35	Loamy sand-----	SM	A-2, A-4	0	0	85-100	85-100	50-95	15-50	0-14	NP
	35-50	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	0	85-100	85-100	50-95	5-50	0-14	NP
	50-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	0-14	NP
140C:												
Sparta----------	0-35	Loamy sand-----	SM	A-2, A-4	0	0	85-100	85-100	50-95	15-50	0-14	NP
	35-47	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	0	85-100	85-100	50-95	5-50	0-14	NP
	47-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	0-14	NP
142:												
Chaseburg-------	0-18	Silt loam------	ML, CL-ML	A-4	0	0	100	100	90-100	85-100	15-26	3-7
	18-60	Silt loam------	ML, CL-ML, CL	A-4	0	0	85-100	85-100	85-100	85-100	15-28	3-9
162B:												
Downs-----------	0-9	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-56	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
162B2:												
Downs-----------	0-9	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-52	Silty clay loam, silt loam.	CL	A-7, A-8	0	0	100	100	100	95-100	35-45	15-25
	52-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
162C:												
Downs-----------	0-9	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-56	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
162C2:												
Downs-----------	0-9	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-52	Silty clay loam, silt loam.	CL	A-7, A-8	0	0	100	100	100	95-100	35-45	15-25
	52-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
162D:												
Downs-----------	0-9	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-56	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
162D2:												
Downs-----------	0-9	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-52	Silty clay loam, silt loam.	CL	A-7, A-8	0	0	100	100	100	95-100	35-45	15-25
	52-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
162E2:												
Downs-----------	0-9	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-52	Silty clay loam, silt loam.	CL	A-7, A-8	0	0	100	100	100	95-100	35-45	15-25
	52-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163B:												
Fayette---------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-51	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	51-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
163B2:												
Fayette----------	0-8	Silt loam------	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
	8-46	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	46-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163C:												
Fayette----------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-51	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	51-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163C2:												
Fayette----------	0-8	Silt loam------	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
	8-46	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	46-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163D:												
Fayette----------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-51	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	51-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163D2:												
Fayette----------	0-8	Silt loam------	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
	8-46	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	46-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163E:												
Fayette----------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-51	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	51-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163E2:												
Fayette----------	0-8	Silt loam------	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
	8-46	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	46-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
163F:												
Fayette----------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-51	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	51-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
163G:												
Fayette----------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-51	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	51-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
178B:												
Waukee-----------	0-22	Loam-----------	CL	A-6	0	0	100	90-100	70-90	50-75	30-40	10-20
	22-33	Loam, sandy clay loam.	CL, SC-SM, SC, CL-ML	A-6, A-4	0	0-5	85-95	80-95	65-85	40-60	20-35	5-15
	33-60	Gravelly sand, loamy coarse sand, sand.	SW, SM, SP-SM, SP	A-1	0-5	0-10	60-90	60-85	20-40	3-25	0-14	NP
196B:												
Volney-----------	0-6	Channery loam	CL, SC, GC, GM-GC	A-4, A-6	10-20	0-20	60-80	60-70	55-65	40-60	25-35	5-15
	6-60	Channery silt loam, channery loam, very channery silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	30-50	0-45	40-75	30-65	20-50	15-40	20-30	3-10
196C:												
Volney-----------	0-6	Channery loam	CL, SC, GC, GM-GC	A-4, A-6	10-20	0-20	60-80	60-70	55-65	40-60	25-35	5-15
	6-60	Channery silt loam, channery loam, very channery silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	30-50	0-45	40-75	30-65	20-50	15-40	20-30	3-10
206C:												
Shullsburg-------	0-13	Silty clay loam	CL	A-6	0	0	100	100	90-100	85-90	30-40	10-15
	13-32	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	85-90	30-45	11-25
	32-60	Silty clay, clay.	CL, CH	A-7	0	0	100	85-100	80-100	80-95	40-70	20-45

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
210E:												
Boone	0-6	Loamy sand	SM, ML, SP-SM	A-2, A-4, A-1	0	0	75-100	75-100	40-90	10-60	0-14	NP
	6-24	Fine sand, coarse sand, loamy sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0	75-100	75-100	30-75	2-35	---	NP
	24-60	Weathered bedrock.			0	0	0	0	0	0	---	NP
210F:												
Boone	0-6	Loamy sand	SM, ML, SP-SM	A-2, A-4, A-1	0	0	75-100	75-100	40-90	10-60	0-14	NP
	6-24	Fine sand, coarse sand, loamy sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0	75-100	75-100	30-75	2-35	---	NP
	24-60	Weathered bedrock.			0	0	0	0	0	0	---	NP
210G:												
Boone	0-6	Loamy sand	SM, ML, SP-SM	A-2, A-4, A-1	0	0	75-100	75-100	40-90	10-60	0-14	NP
	6-24	Fine sand, coarse sand, loamy sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0	75-100	75-100	30-75	2-35	---	NP
	24-60	Weathered bedrock.			0	0	0	0	0	0	---	NP
249C:												
Zwingle	0-11	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	11-41	Silty clay, silty clay loam, clay.	CH	A-7	0	0	100	100	100	95-100	55-70	30-40
	41-60	Stratified loam to loamy sand.	CL, SC, CL-ML, SC-SM	A-4, A-6	0	0	100	90-95	60-95	40-80	20-30	5-15
291:												
Atterberry	0-25	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	5-15
	25-51	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	51-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	0	100	100	95-100	95-100	35-55	15-30
320:												
Arenzville	0-23	Silt loam	ML, CL-ML, CL	A-4	0	0	100	100	95-100	80-95	20-30	4-10
	23-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-45	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
478G:												
Nordness---------	0-5	Silt loam-------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	5-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP
Rock outcrop----	0-60	Unweathered bedrock.	---	---	0	0	0	0	0	0	0-14	NP
484:												
Lawson-----------	0-9	Silt loam-------	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	85-100	20-40	5-20
	9-32	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	0	100	100	90-100	85-100	20-30	5-10
	32-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	60-100	20-45	10-25
485:												
Spillville-------	0-47	Loam------------	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	47-60	Sandy clay loam, loam, sandy loam.	CL, CL-ML, SC-SM, SC	A-6, A-4	0	0	100	95-100	80-90	35-75	20-40	5-15
487B:												
Otter------------	0-25	Silt loam-------	CL	A-6, A-7, A-4	0	0	100	95-100	90-100	80-100	25-45	7-20
	25-60	Silt loam, loam, silty clay loam.	CL	A-6, A-7	0	0	100	95-100	90-100	80-100	30-45	10-20
Worthen----------	0-34	Silt loam-------	CL	A-4, A-6	0	0	100	100	95-100	80-100	25-40	7-21
	34-60	Silt loam-------	CL	A-4, A-6	0	0	100	100	95-100	80-100	25-40	7-21
490:												
Caneek-----------	0-31	Silt loam-------	ML, CL-ML, CL	A-4	0	0	100	100	95-100	90-95	25-35	5-10
	31-60	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	90-95	35-45	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
499C:												
Nordness--------	0-5	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	5-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP
499D:												
Nordness--------	0-5	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	5-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP
499D2:												
Nordness--------	0-9	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	9-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
499E:												
Nordness---------	0-5	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	5-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP
499E2:												
Nordness---------	0-9	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	9-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP
499F:												
Nordness---------	0-5	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	5-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
499G:												
Nordness	0-5	Silt loam	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	5-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	14-15	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	15-60	Unweathered bedrock, weathered bedrock.			0	0	0	0	0	0	---	NP
589:												
Otter	0-25	Silt loam	CL	A-6, A-7, A-4	0	0	100	95-100	90-100	80-100	25-45	7-20
	25-60	Silt loam, loam, silty clay loam.	CL	A-6, A-7	0	0	100	95-100	90-100	80-100	30-45	10-20
703C:												
Dubuque	0-7	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-27	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	27-28	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-85	50-70	30-45
	28-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
703C2:												
Dubuque	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-24	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	24-25	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-85	50-70	30-45
	25-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
703D:												
Dubuque	0-7	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-27	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	27-28	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-85	50-70	30-45
	28-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
703D2:												
Dubuque----------	0-9	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-24	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	24-25	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-85	50-70	30-45
	25-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
703E:												
Dubuque----------	0-7	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-27	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	27-28	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-85	50-70	30-45
	28-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
703E2:												
Dubuque----------	0-9	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	9-24	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	24-25	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-85	50-70	30-45
	25-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
703F:												
Dubuque----------	0-7	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-27	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	27-28	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-85	50-70	30-45
	28-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
721C:												
Massbach---------	0-9	Silt loam------	CL	A-6	0	0	100	100	95-100	90-100	30-40	10-20
	9-35	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	90-100	30-45	15-25
	35-60	Weathered bedrock.			0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
721D:												
Massbach---------	0-9	Silt loam------	CL	A-6	0	0	100	100	95-100	90-100	30-40	10-20
	9-35	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	90-100	30-45	15-25
	35-60	Weathered bedrock.			0	0	0	0	0	0	---	NP
740C:												
Hawick-----------	0-10	Gravelly sand	SP-SM, SM	A-1, A-2, A-3	0-2	0-5	75-95	60-95	35-70	5-35	0-14	NP-4
	10-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-2	0-5	60-95	50-95	30-65	2-10	0-14	NP
740G:												
Hawick-----------	0-10	Gravelly sand	SP-SM, SM	A-1, A-2, A-3	0-2	0-5	75-95	60-95	35-70	5-35	0-14	NP-4
	10-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-2	0-5	60-95	50-95	30-65	2-10	0-14	NP
778B:												
Sattre-----------	0-9	Loam-----------	CL, CL-ML, ML	A-4	0	0	100	90-100	70-90	50-75	25-35	5-10
	9-31	Loam, sandy clay loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6	0	0-5	85-100	80-100	70-95	40-60	20-35	5-15
	31-60	Gravelly coarse sand, sand, gravelly sand.	SW, SM, SP, SP-SM	A-1	0	2-10	80-90	50-85	20-40	3-25	0-14	NP
793B:												
Bertrand---------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-90	25-35	6-15
	10-60	Silt loam, silty clay loam.	CL	A-6, A-4	0	0	100	100	90-100	85-95	25-40	7-20
793C:												
Bertrand---------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-90	25-35	6-15
	10-60	Silt loam, silty clay loam.	CL	A-6, A-4	0	0	100	100	90-100	85-95	25-40	7-20
793D2:												
Bertrand---------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-90	25-35	6-15
	10-60	Silt loam, silty clay loam.	CL	A-6, A-4	0	0	100	100	90-100	85-95	25-40	7-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
793E:												
Bertrand--------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-90	25-35	6-15
	10-60	Silt loam, silty clay loam.	CL	A-6, A-4	0	0	100	100	90-100	85-95	25-40	7-20
826:												
Rowley----------	0-18	Silt loam------	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-35	8-13
	18-22	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-50	10-25
	22-60	Stratified silt loam to sand.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0	100	100	80-100	35-75	20-30	4-11
837C:												
Village---------	0-8	Silt loam------	CL, CL-ML	A-4	0	0	100	100	95-100	95-100	25-35	5-15
	8-36	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6	0	0	100	100	90-100	70-95	30-45	10-20
	36-57	Clay, silty clay.	CH, SC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	57-60	Sandy clay loam, clay loam, loam.	CL, SM, SC	A-3, A-4, A-6	0-2	2-5	65-95	60-90	40-75	30-60	25-50	10-25
837C2:												
Village---------	0-7	Silt loam------	CL	A-4	0	0	100	100	95-100	95-100	30-35	10-15
	7-34	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6	0	0	100	100	90-100	70-95	30-45	10-20
	34-53	Clay, silty clay.	CH, SC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	53-60	Sandy clay loam, clay loam, loam.	CL, SM, SC	A-3, A-4, A-6	0-2	2-5	65-95	60-90	40-75	30-60	25-50	10-25
837D:												
Village---------	0-8	Silt loam------	CL, CL-ML	A-4	0	0	100	100	95-100	95-100	25-35	5-15
	8-36	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6	0	0	100	100	90-100	70-95	30-45	10-20
	36-57	Clay, silty clay.	CH, SC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	57-60	Sandy clay loam, clay loam, loam.	CL, SM, SC	A-3, A-4, A-6	0-2	2-5	65-95	60-90	40-75	30-60	25-50	10-25

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
837D2:												
Village----------	0-7	Silt loam-------	CL	A-4	0	0	100	100	95-100	95-100	30-35	10-15
	7-34	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6	0	0	100	100	90-100	70-95	30-45	10-20
	34-53	Clay, silty clay.	CH, SC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	53-60	Sandy clay loam, clay loam, loam.	CL, SM, SC	A-3, A-4, A-6	0-2	2-5	65-95	60-90	40-75	30-60	25-50	10-25
837E:												
Village----------	0-8	Silt loam-------	CL, CL-ML	A-4	0	0	100	100	95-100	95-100	25-35	5-15
	8-36	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6	0	0	100	100	90-100	70-95	30-45	10-20
	36-57	Clay, silty clay.	CH, SC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	57-60	Sandy clay loam, clay loam, loam.	CL, SM, SC	A-3, A-4, A-6	0-2	2-5	65-95	60-90	40-75	30-60	25-50	10-25
837E2:												
Village----------	0-7	Silt loam-------	CL	A-4	0	0	100	100	95-100	95-100	30-35	10-15
	7-34	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6	0	0	100	100	90-100	70-95	30-45	10-20
	34-53	Clay, silty clay.	CH, SC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	53-60	Sandy clay loam, clay loam, loam.	CL, SM, SC	A-3, A-4, A-6	0-2	2-5	65-95	60-90	40-75	30-60	25-50	10-25
837F:												
Village----------	0-8	Silt loam-------	CL, CL-ML	A-4	0	0	100	100	95-100	95-100	25-35	5-15
	8-36	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6	0	0	100	100	90-100	70-95	30-45	10-20
	36-57	Clay, silty clay.	CH, SC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	57-60	Sandy clay loam, clay loam, loam.	CL, SM, SC	A-3, A-4, A-6	0-2	2-5	65-95	60-90	40-75	30-60	25-50	10-25

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
838C2:												
Allamakee-------	0-6	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-35	10-15
	6-22	Silt loam, silty clay loam, clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-45	10-20
	22-29	Clay loam, clay, silty clay.	CH, SC, GM, GC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	29-45	Cobbly clay----	GC, SC, CH	A-7	0-2	15-35	70-95	65-95	55-90	40-70	55-70	30-40
	45-60	Stratified sandy loam to clay.	CL, SC, SM, CH	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
838D:												
Allamakee-------	0-8	Silt loam------	CL, CL-ML	A-6	0	0	100	100	95-100	95-100	25-35	5-15
	8-27	Silt loam, silty clay loam, clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-40	10-20
	27-32	Clay, silty clay.	CH, SC, GM, GC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	32-48	Cobbly clay----	GC, SC, CH	A-7	0-2	15-35	70-95	65-95	55-90	40-70	55-70	30-40
	48-60	Stratified sandy loam to clay.	CL, SC, SM, CH	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
838D2:												
Allamakee-------	0-6	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-35	10-15
	6-22	Silt loam, silty clay loam, clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-45	10-20
	22-29	Clay loam, clay, silty clay.	CH, SC, GM, GC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	29-45	Cobbly clay----	GC, SC, CH	A-7	0-2	15-35	70-95	65-95	55-90	40-70	55-70	30-40
	45-60	Stratified sandy loam to clay.	CL, SC, SM, CH	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
838E2:												
Allamakee-------	0-6	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-35	10-15
	6-22	Silt loam, silty clay loam, clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-45	10-20
	22-29	Clay loam, clay, silty clay.	CH, SC, GM, GC	A-7	0-2	2-5	70-95	65-95	55-90	40-70	50-70	20-40
	29-45	Cobbly clay----	GC, SC, CH	A-7	0-2	15-35	70-95	65-95	55-90	40-70	55-70	30-40
	45-60	Stratified sandy loam to clay.	CL, SC, SM, CH	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
840E:												
Lacrescent------	0-12	Silt loam------	CL, ML	A-6	0	0-15	90-100	80-100	60-95	50-90	30-40	10-15
	12-44	Cobbly silt loam, cobbly fine sandy loam, very cobbly loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0	30-55	55-80	45-80	40-65	20-60	20-35	3-12
	44-60	Extremely cobbly loam, very cobbly silt loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0	50-65	50-75	40-65	35-60	15-55	15-30	NP-12
840F:												
Lacrescent------	0-12	Silt loam------	CL, ML	A-6	0	0-15	90-100	80-100	60-95	50-90	30-40	10-15
	12-44	Cobbly silt loam, cobbly fine sandy loam, very cobbly loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0	30-55	55-80	45-80	40-65	20-60	20-35	3-12
	44-60	Extremely cobbly loam, very cobbly silt loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0	50-65	50-75	40-65	35-60	15-55	15-30	NP-12

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
840G:												
Lacrescent	0-12	Silt loam	CL, ML	A-6	0	0-15	90-100	80-100	60-95	50-90	30-40	10-15
	12-44	Cobbly silt loam, cobbly fine sandy loam, very cobbly loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0	30-55	55-80	45-80	40-65	20-60	20-35	3-12
	44-60	Extremely cobbly loam, very cobbly silt loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0	50-65	50-75	40-65	35-60	15-55	15-30	NP-12
841G:												
Rock outcrop	0-60	Unweathered bedrock.	---	---	0	0	0	0	0	0	0-14	NP
Boone	0-6	Loamy sand	SM, ML, SP-SM	A-2, A-4, A-1	0	0	75-100	75-100	40-90	10-60	0-14	NP
	6-24	Fine sand, coarse sand, loamy sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0	75-100	75-100	30-75	2-35	---	NP
	24-60	Weathered bedrock.	---	---	0	0	0	0	0	0	---	NP
843:												
Elon	0-60	Silt loam	CL	A-6	0	0	100	100	90-100	85-95	30-40	10-20
861D:												
Yellowriver	0-12	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	12-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-45	15-25
	40-60	Silt loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
861D2:												
Yellowriver	0-12	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	12-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-45	15-25
	40-60	Silt loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
861E:												
Yellowriver	0-12	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	12-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-45	15-25
	40-60	Silt loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
861E2:												
Yellowriver-----	0-12	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	12-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-45	15-25
	40-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
861F:												
Yellowriver-----	0-12	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	12-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-45	15-25
	40-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
861G:												
Yellowriver-----	0-12	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	12-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	35-45	15-25
	40-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
862D:												
Churchtown------	0-17	Loam-----------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	17-44	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	44-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
862D2:												
Churchtown------	0-17	Loam-----------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	17-44	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	44-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
862E:												
Churchtown------	0-17	Loam-----------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	17-44	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	44-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
862E2:												
Churchtown------	0-17	Loam-----------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	17-44	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	44-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
862F:												
Churchtown------	0-17	Loam------------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	80-90	30-40	10-20
	17-44	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	44-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
903C2:												
Frankville------	0-7	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-25	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	25-31	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-80	50-70	30-45
	31-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
903D:												
Frankville------	0-7	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-26	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	26-33	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-80	50-70	30-45
	33-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
903D2:												
Frankville------	0-7	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-25	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	25-31	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-80	50-70	30-45
	31-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP
903E2:												
Frankville------	0-7	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	7-25	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	25-31	Clay, silty clay.	CH	A-7	0	2-10	85-95	80-90	70-85	65-80	50-70	30-45
	31-60	Unweathered bedrock.			0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
912C:												
Paintcreek------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	8-15	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-40	15-20
	15-35	Clay, silty clay.	SC, CH, GC, CL	A-7	0-2	2-5	70-95	65-95	55-90	40-70	45-70	20-40
	35-55	Cobbly clay----	GC, GM, SM, SC	A-7	0-2	15-35	70-95	65-95	55-90	40-70	50-70	20-40
	55-60	Stratified sandy loam to clay.	CL, SC, CH, GC	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
912D:												
Paintcreek------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	8-15	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-40	15-20
	15-35	Clay, silty clay.	SC, CH, GC, CL	A-7	0-2	2-5	70-95	65-95	55-90	40-70	45-70	20-40
	35-55	Cobbly clay----	GC, GM, SM, SC	A-7	0-2	15-35	70-95	65-95	55-90	40-70	50-70	20-40
	55-60	Stratified sandy loam to clay.	CL, SC, CH, GC	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
912D2:												
Paintcreek------	0-6	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-35	10-15
	6-11	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	90-100	75-95	30-40	15-20
	11-31	Clay, silty clay.	SC, CH, GC, CL	A-7	0-2	2-5	70-95	65-95	55-90	40-70	45-70	20-40
	31-51	Cobbly clay----	GC, GM, SM, SC	A-7	0-2	15-35	70-95	65-95	55-90	40-70	50-70	20-40
	51-60	Stratified sandy loam to clay.	CL, SC, CH, GC	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
912E:												
Paintcreek------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	8-15	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-40	15-20
	15-35	Clay, silty clay.	SC, CH, GC, CL	A-7	0-2	2-5	70-95	65-95	55-90	40-70	45-70	20-40
	35-55	Cobbly clay----	GC, GM, SM, SC	A-7	0-2	15-35	70-95	65-95	55-90	40-70	50-70	20-40
	55-60	Stratified sandy loam to clay.	CL, SC, CH, GC	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
912E2:												
Paintcreek------	0-6	Silt loam------	CL	A-6	0	0	100	100	95-100	95-100	30-35	10-15
	6-11	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	90-100	75-95	30-40	15-20
	11-31	Clay, silty clay.	SC, CH, GC, CL	A-7	0-2	2-5	70-95	65-95	55-90	40-70	45-70	20-40
	31-51	Cobbly clay----	GC, GM, SM, SC	A-7	0-2	15-35	70-95	65-95	55-90	40-70	50-70	20-40
	51-60	Stratified sandy loam to clay.	CL, SC, CH, GC	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
912F:												
Paintcreek------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	8-15	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	90-100	70-95	30-40	15-20
	15-35	Clay, silty clay.	SC, CH, GC, CL	A-7	0-2	2-5	70-95	65-95	55-90	40-70	45-70	20-40
	35-55	Cobbly clay----	GC, GM, SM, SC	A-7	0-2	15-35	70-95	65-95	55-90	40-70	50-70	20-40
	55-60	Stratified sandy loam to clay.	CL, SC, CH, GC	A-2-6, A-6, A-7	0-2	2-5	65-95	60-90	40-75	30-60	25-60	10-35
930:												
Orion-----------	0-8	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	80-100	25-35	4-12
	8-28	Stratified silt loam to very fine sand.	CL, CL-ML	A-4	0	0	100	100	90-100	70-80	20-30	4-10
	28-49	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	0	100	100	85-100	85-100	20-40	4-18
	49-60	Stratified silt loam to sand.	CL, CL-ML	A-4	0	0	80-100	80-100	80-100	80-100	20-30	4-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
951G:												
Medary----------	0-4	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	60-75	20-30	5-10
	4-8	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	60-95	20-40	5-20
	8-26	Silty clay, clay.	CH	A-7	0	0	100	100	90-100	75-95	50-59	30-35
	26-60	Stratified silty clay to silt loam.	CH, CL	A-7, A-6	0	0	100	100	90-100	75-95	35-55	15-30
977:												
Richwood--------	0-16	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	90-100	85-95	25-35	8-13
	16-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-40	7-20
977B:												
Richwood--------	0-16	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	90-100	85-95	25-35	8-13
	16-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-40	7-20
978B:												
Festina---------	0-11	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	11-38	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	38-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
978C:												
Festina---------	0-11	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	11-38	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	38-60	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
981B:												
Worthen---------	0-34	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	80-100	25-40	7-21
	34-60	Silt loam------	CL	A-4, A-6	0	0	100	100	95-100	80-100	25-40	7-21
1120D:												
Lycurgus--------	0-13	Silt loam------	CL, CL-ML	A-6, A-7	0	0	100	100	95-100	80-90	30-40	10-20
	13-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	95-100	85-100	35-50	10-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
1120E:												
Lycurgus--------	0-13	Silt loam------	CL, CL-ML	A-6, A-7	0	0	100	100	95-100	80-90	30-40	10-20
	13-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	95-100	85-100	35-50	10-20
1120F:												
Lycurgus--------	0-13	Silt loam------	CL, CL-ML	A-6, A-7	0	0	100	100	95-100	80-90	30-40	10-20
	13-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	95-100	85-100	35-50	10-20
1490:												
Caneek----------	0-31	Silt loam------	ML, CL-ML, CL	A-4	0	0	100	100	95-100	90-95	25-35	5-10
	31-60	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	90-95	35-45	10-20
1496:												
Arenzville------	0-23	Silt loam------	ML, CL-ML, CL	A-4	0	0	100	100	95-100	80-95	20-30	4-10
	23-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-45	10-20
Volney----------	0-6	Channery loam	CL, SC, GC, GM-GC	A-4, A-6	10-20	0-20	60-80	60-70	55-65	40-60	25-35	5-15
	6-60	Channery silt loam, channery loam, very channery silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	30-50	0-45	40-75	30-65	20-50	15-40	20-30	3-10
1496B:												
Arenzville------	0-23	Silt loam------	ML, CL-ML, CL	A-4	0	0	100	100	95-100	80-95	20-30	4-10
	23-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-45	10-20
Volney----------	0-6	Channery loam	CL, SC, GC, GM-GC	A-4, A-6	10-20	0-20	60-80	60-70	55-65	40-60	25-35	5-15
	6-60	Channery silt loam, channery loam, very channery silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	30-50	0-45	40-75	30-65	20-50	15-40	20-30	3-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1793G:												
Bertrand--------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-90	25-35	6-15
	10-60	Silt loam, silty clay loam.	CL	A-6, A-4	0	0	100	100	90-100	85-95	25-40	7-20
Chelsea---------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	100	65-80	10-35	0-14	NP
	3-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-80	3-15	0-14	NP
2670:												
Ion-------------	0-36	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-15
	36-60	Silt loam------	CL	A-6, A-7-6	0	0	100	100	100	90-100	30-45	10-20
5010, 5030. Pits												
5040. Orthents												

PHYSICAL PROPERTIES OF THE SOILS

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
40D:												
Fayette---------	0-13	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	13-51	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	51-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
41B:												
Sparta----------	0-23	1-5	1.30-1.50	6.00-20.00	0.06-0.09	Low------	1.0-2.0	0.15	0.15	5	1	250
	23-38	1-8	1.40-1.60	6.00-20.00	0.05-0.11	Low------	0.1-1.0	0.15	0.15			
	38-60	0-5	1.50-1.70	6.00-20.00	0.04-0.07	Low------	0.0-0.5	0.15	0.15			
41C:												
Sparta----------	0-23	1-5	1.30-1.50	6.00-20.00	0.06-0.09	Low------	0.5-1.5	0.15	0.15	5	1	250
	23-38	1-8	1.40-1.60	6.00-20.00	0.05-0.11	Low------	0.1-1.0	0.15	0.15			
	38-60	0-5	1.50-1.70	6.00-20.00	0.04-0.07	Low------	0.0-0.5	0.15	0.15			
41D:												
Sparta----------	0-23	1-5	1.30-1.50	6.00-20.00	0.06-0.09	Low------	0.5-1.5	0.15	0.15	5	1	250
	23-38	1-8	1.40-1.60	6.00-20.00	0.05-0.11	Low------	0.1-1.0	0.15	0.15			
	38-60	0-5	1.50-1.70	6.00-20.00	0.04-0.07	Low------	0.0-0.5	0.15	0.15			
63B:												
Chelsea---------	0-3	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.5-1.5	0.17	0.17	5	2	134
	3-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
63C:												
Chelsea---------	0-3	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.5-1.5	0.17	0.17	5	2	134
	3-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
63D:												
Chelsea---------	0-3	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.5-1.5	0.17	0.17	5	2	134
	3-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
63E:												
Chelsea---------	0-3	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.5-1.5	0.17	0.17	5	2	134
	3-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
63F:												
Chelsea---------	0-3	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.5-1.5	0.17	0.17	5	2	134
	3-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
63G:												
Chelsea---------	0-3	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.5-1.5	0.17	0.17	5	2	134
	3-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
85:												
Eitzen----------	0-30	18-25	1.35-1.45	0.60-2.00	0.22-0.24	Low------	2.0-4.0	0.28	0.28	5	6	48
	30-53	18-27	1.30-1.45	0.60-2.00	0.20-0.22	Low------	---	0.28	0.28			
	53-60	18-27	1.40-1.65	0.60-2.00	0.18-0.20	Low------	---	0.28	0.28			
85B:												
Eitzen----------	0-30	18-25	1.35-1.45	0.60-2.00	0.22-0.24	Low------	2.0-4.0	0.28	0.28	5	6	48
	30-53	18-27	1.30-1.45	0.60-2.00	0.20-0.22	Low------	---	0.28	0.28			
	53-60	18-27	1.40-1.65	0.60-2.00	0.18-0.20	Low------	---	0.28	0.28			
98:												
Huntsville------	0-39	18-27	1.15-1.35	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	39-60	18-27	1.20-1.40	0.60-2.00	0.20-0.22	Moderate	0.2-0.5	0.28	0.28			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
98B:												
Huntsville------	0-39	18-27	1.15-1.35	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	39-60	18-27	1.20-1.40	0.60-2.00	0.20-0.22	Moderate	0.2-0.5	0.28	0.28			
118:												
Garwin----------	0-20	30-35	1.30-1.35	0.60-2.00	0.21-0.23	High-----	6.0-7.0	0.28	0.28	5	7	38
	20-24	27-35	1.28-1.35	0.60-2.00	0.18-0.20	High-----	1.0-2.0	0.28	0.28			
	24-60	20-26	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
119B:												
Muscatine-------	0-10	24-27	1.28-1.32	0.60-2.00	0.22-0.24	Moderate	4.0-6.0	0.28	0.28	5	6	48
	10-34	30-35	1.28-1.35	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	34-60	22-30	1.35-1.40	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
120B:												
Tama------------	0-18	24-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	18-44	27-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	44-60	22-28	1.35-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
120C:												
Tama------------	0-18	24-27	1.25-1.30	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	18-44	27-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	44-60	22-28	1.35-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
129B:												
Arenzville------	0-23	10-18	1.20-1.55	0.60-2.00	0.20-0.24	Low------	1.0-3.0	0.37	0.37	5	5	56
	23-60	10-30	1.25-1.45	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
Chaseburg-------	0-18	12-16	1.35-1.55	0.60-2.00	0.22-0.24	Low------	0.5-1.5	0.37	0.37	5	5	56
	18-60	10-18	1.55-1.65	0.60-2.00	0.18-0.22	Low------	---	0.37	0.37			
140B:												
Sparta----------	0-35	3-10	1.20-1.40	2.00-6.00	0.09-0.12	Low------	1.0-2.0	0.17	0.17	5	2	134
	35-50	1-8	1.40-1.60	6.00-20.00	0.05-0.11	Low------	0.1-1.0	0.15	0.15			
	50-60	0-5	1.50-1.70	6.00-20.00	0.04-0.07	Low------	0.0-0.5	0.15	0.15			
140C:												
Sparta----------	0-35	3-10	1.20-1.40	2.00-6.00	0.09-0.12	Low------	1.0-2.0	0.17	0.17	5	2	134
	35-47	1-8	1.40-1.60	6.00-20.00	0.05-0.11	Low------	0.1-1.0	0.15	0.15			
	47-60	0-5	1.50-1.70	6.00-20.00	0.04-0.07	Low------	0.0-0.5	0.15	0.15			
142:												
Chaseburg-------	0-18	12-16	1.35-1.55	0.60-2.00	0.22-0.24	Low------	1.0-2.0	0.37	0.37	5	5	56
	18-60	10-18	1.55-1.65	0.60-2.00	0.18-0.22	Low------	---	0.37	0.37			
162B:												
Downs-----------	0-9	18-26	1.25-1.30	0.60-2.00	0.21-0.23	Low------	2.5-3.5	0.32	0.32	5	6	48
	9-56	26-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	56-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
162B2:												
Downs-----------	0-9	18-26	1.25-1.30	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.32	0.32	5	6	48
	9-52	26-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	52-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
162C:												
Downs-----------	0-9	18-26	1.25-1.30	0.60-2.00	0.21-0.23	Low------	2.5-3.5	0.32	0.32	5	6	48
	9-56	26-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	56-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
162C2:												
Downs-----------	0-9	18-26	1.25-1.30	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.32	0.32	5	6	48
	9-52	26-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	52-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
162D:												
Downs-----------	0-9	18-26	1.25-1.30	0.60-2.00	0.21-0.23	Low------	2.5-3.5	0.32	0.32	5	6	48
	9-56	26-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	56-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
162D2:												
Downs-----------	0-9	18-26	1.25-1.30	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.32	0.32	5	6	48
	9-52	26-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	52-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
162E2:												
Downs-----------	0-9	18-26	1.25-1.30	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.32	0.32	5	6	48
	9-52	26-35	1.30-1.35	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	52-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163B:												
Fayette---------	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	10-51	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	51-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163B2:												
Fayette---------	0-8	25-27	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	6	48
	8-46	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	46-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163C:												
Fayette---------	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	10-51	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	51-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163C2:												
Fayette---------	0-8	25-27	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	6	48
	8-46	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	46-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163D:												
Fayette---------	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	10-51	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	51-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163D2:												
Fayette---------	0-8	25-27	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	6	48
	8-46	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	46-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163E:												
Fayette---------	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	10-51	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	51-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163E2:												
Fayette---------	0-8	25-27	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	6	48
	8-46	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	46-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
163F:												
Fayette---------	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	10-51	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	51-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
163G:												
Fayette---------	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	10-51	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	51-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
178B:												
Waukee----------	0-22	18-24	1.40-1.45	0.60-2.00	0.20-0.22	Low------	3.0-4.0	0.24	0.24	4	6	48
	22-33	18-27	1.40-1.50	0.60-2.00	0.15-0.19	Low------	1.0-2.0	0.28	0.28			
	33-60	2-8	1.50-1.75	>20.00	0.02-0.06	Low------	0.0-1.0	0.10	0.17			
196B:												
Volney----------	0-6	18-24	1.40-1.55	2.00-6.00	0.13-0.16	Low------	3.0-5.0	0.24	0.43	4	8	---
	6-60	12-25	1.70-1.90	>20.00	0.02-0.08	Low------	0.0-1.0	0.24	0.43			
196C:												
Volney----------	0-6	18-24	1.40-1.55	2.00-6.00	0.13-0.16	Low------	3.0-5.0	0.24	0.43	4	8	---
	6-60	12-25	1.70-1.90	>20.00	0.02-0.08	Low------	0.0-1.0	0.24	0.43			
206C:												
Shullsburg------	0-13	27-35	1.40-1.50	0.60-2.00	0.20-0.24	Low------	4.0-5.0	0.32	0.32	3	7	38
	13-32	24-35	1.40-1.50	0.20-0.60	0.18-0.22	Moderate	---	0.32	0.32			
	32-60	40-70	1.50-1.60	0.06-0.20	0.12-0.16	High-----	---	0.32	0.32			
210E:												
Boone-----------	0-6	2-6	1.55-1.65	6.00-20.00	0.10-0.13	Low------	0.5-1.5	0.17	0.17	3	2	134
	6-24	0-3	1.55-1.70	6.00-20.00	0.04-0.11	Low------	0.0-0.5	0.15	0.15			
	24-60	---	---	0.20-2.00	---	---	---	---	---			
210F:												
Boone-----------	0-6	2-6	1.55-1.65	6.00-20.00	0.10-0.13	Low------	0.5-1.5	0.17	0.17	3	2	134
	6-24	0-3	1.55-1.70	6.00-20.00	0.04-0.11	Low------	0.0-0.5	0.15	0.15			
	24-60	---	---	0.20-2.00	---	---	---	---	---			
210G:												
Boone-----------	0-6	2-6	1.55-1.65	6.00-20.00	0.10-0.13	Low------	0.5-1.5	0.17	0.17	3	2	134
	6-24	0-3	1.55-1.70	6.00-20.00	0.04-0.11	Low------	0.0-0.5	0.15	0.15			
	24-60	---	---	0.20-2.00	---	---	---	---	---			
249C:												
Zwingle---------	0-11	18-27	1.25-1.30	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.43	0.43	3	6	48
	11-41	38-60	1.30-1.45	0.00-0.06	0.12-0.16	High-----	0.0-1.0	0.43	0.43			
	41-60	8-20	1.45-1.60	2.00-6.00	0.08-0.10	Low------	0.0-1.0	0.43	0.43			
291:												
Atterberry------	0-25	20-26	1.35-1.55	0.60-2.00	0.22-0.25	Low------	3.0-4.0	0.32	0.32	5	6	48
	25-51	15-26	1.40-1.60	0.60-2.00	0.21-0.24	Low------	0.5-1.0	0.32	0.32			
	51-60	25-35	1.40-1.60	0.60-2.00	0.14-0.24	Moderate	0.1-0.5	0.43	0.43			
320:												
Arenzville------	0-23	10-18	1.20-1.55	0.60-2.00	0.20-0.24	Low------	1.5-2.5	0.37	0.37	5	5	56
	23-60	10-30	1.25-1.45	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
478G:												
Nordness--------	0-5	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	1	6	48
	5-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
478G:												
Rock outcrop----	0-60	---	---	---	---	---	---	---	---	---	8	---
484:												
Lawson----------	0-9	10-27	1.20-1.55	0.60-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	5	56
	9-32	10-30	1.20-1.55	0.60-2.00	0.18-0.22	Low------	3.0-7.0	0.28	0.28			
	32-60	18-30	1.55-1.65	0.60-2.00	0.18-0.20	Moderate	1.0-4.0	0.43	0.43			
485:												
Spillville------	0-47	18-26	1.45-1.55	0.60-2.00	0.19-0.21	Moderate	4.0-5.0	0.24	0.24	5	6	48
	47-60	14-24	1.55-1.70	0.60-6.00	0.15-0.18	Low------	2.0-3.0	0.28	0.28			
487B:												
Otter-----------	0-25	18-27	1.10-1.25	0.60-2.00	0.22-0.24	Low------	3.5-5.5	0.28	0.28	5	6	48
	25-60	18-27	1.20-1.45	0.60-2.00	0.17-0.22	Moderate	1.0-3.0	0.43	0.43			
Worthen---------	0-34	15-22	1.20-1.40	0.60-2.00	0.22-0.24	Low------	3.5-4.5	0.32	0.32	5	6	48
	34-60	18-24	1.20-1.40	0.60-2.00	0.20-0.22	Low------	0.2-1.0	0.43	0.43			
490:												
Caneek----------	0-31	18-24	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.7-1.7	0.37	0.37	5	4L	86
	31-60	18-28	1.25-1.40	0.60-2.00	0.22-0.24	Moderate	0.0-0.5	0.37	0.37			
499C:												
Nordness--------	0-5	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	1	6	48
	5-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			
499D:												
Nordness--------	0-5	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	1	6	48
	5-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			
499D2:												
Nordness--------	0-9	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low------	1.5-2.5	0.37	0.37	1	6	48
	9-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.37	0.37			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			
499E:												
Nordness--------	0-5	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	1	6	48
	5-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			
499E2:												
Nordness--------	0-9	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low------	1.5-2.5	0.37	0.37	1	6	48
	9-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.37	0.37			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			
499F:												
Nordness--------	0-5	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	1	6	48
	5-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
499G:												
Nordness---------	0-5	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	2.0-3.0	0.32	0.32	1	6	48
	5-14	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	14-15	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	15-60	---	---	0.00-0.06	---	---	---	---	---			
589:												
Otter------------	0-25	18-27	1.10-1.25	0.60-2.00	0.22-0.24	Low-------	6.0-7.0	0.28	0.28	5	6	48
	25-60	18-27	1.20-1.45	0.60-2.00	0.17-0.22	Moderate	1.0-3.0	0.43	0.43			
703C:												
Dubuque----------	0-7	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	2.0-3.0	0.37	0.37	3	6	48
	7-27	26-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.37	0.37			
	27-28	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	28-60	---	---	0.00-0.06	---	---	---	---	---			
703C2:												
Dubuque----------	0-9	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	1.5-2.5	0.37	0.37	3	6	48
	9-24	26-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.37	0.37			
	24-25	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	25-60	---	---	0.00-0.06	---	---	---	---	---			
703D:												
Dubuque----------	0-7	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	2.0-3.0	0.37	0.37	3	6	48
	7-27	26-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.37	0.37			
	27-28	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	28-32	---	---	0.00-0.06	---	---	---	---	---			
703D2:												
Dubuque----------	0-9	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	1.5-2.5	0.37	0.37	3	6	48
	9-24	26-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.37	0.37			
	24-25	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	25-60	---	---	0.00-0.06	---	---	---	---	---			
703E:												
Dubuque----------	0-7	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	2.0-3.0	0.37	0.37	3	6	48
	7-27	26-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.37	0.37			
	27-28	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	28-60	---	---	0.00-0.06	---	---	---	---	---			
703E2:												
Dubuque----------	0-9	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	1.5-2.5	0.37	0.37	3	6	48
	9-24	26-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.37	0.37			
	24-25	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	25-60	---	---	0.00-0.06	---	---	---	---	---			
703F:												
Dubuque----------	0-7	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-------	2.0-3.0	0.37	0.37	3	6	48
	7-27	26-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.37	0.37			
	27-28	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High------	0.0-0.5	0.37	0.37			
	28-60	---	---	0.00-0.06	---	---	---	---	---			
721C:												
Massbach---------	0-9	22-27	1.15-1.35	0.60-2.00	0.22-0.24	Low-------	2.5-3.5	0.32	0.32	4	6	48
	9-35	25-35	1.30-1.60	0.60-2.00	0.18-0.20	Moderate	0.5-2.0	0.43	0.43			
	35-60	---	---	0.01-0.20	---	---	---	---	---			
721D:												
Massbach---------	0-9	22-27	1.15-1.35	0.60-2.00	0.22-0.24	Low-------	2.5-3.5	0.32	0.32	4	6	48
	9-35	25-35	1.30-1.60	0.60-2.00	0.18-0.20	Moderate	0.5-2.0	0.43	0.43			
	35-60	---	---	0.01-0.20	---	---	---	---	---			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
740C:												
Hawick----------	0-10	2-10	1.50-1.65	2.00-20.00	0.03-0.13	Low------	0.5-1.5	0.10	0.15	5	8	---
	10-60	1-5	1.55-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
740G:												
Hawick----------	0-10	2-10	1.50-1.65	2.00-20.00	0.03-0.13	Low------	0.5-1.5	0.10	0.15	5	8	---
	10-60	1-5	1.55-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
778B:												
Sattre----------	0-9	18-24	1.40-1.45	0.60-2.00	0.18-0.20	Low------	2.5-3.5	0.24	0.24	4	6	48
	9-31	18-28	1.40-1.50	0.60-6.00	0.15-0.17	Low------	0.5-1.0	0.28	0.28			
	31-60	2-8	1.50-1.75	>20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.20			
793B:												
Bertrand--------	0-10	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	4	5	56
	10-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
793C:												
Bertrand--------	0-10	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	4	5	56
	10-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
793D2:												
Bertrand--------	0-10	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	1.5-2.5	0.37	0.37	4	5	56
	10-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
793E:												
Bertrand--------	0-10	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	4	5	56
	10-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
826:												
Rowley----------	0-18	15-22	1.35-1.45	0.60-2.00	0.22-0.24	Low------	4.0-5.0	0.28	0.28	4	5	56
	18-22	20-30	1.35-1.65	0.60-2.00	0.18-0.22	Low------	---	0.43	0.43			
	22-60	10-20	1.55-1.65	0.60-2.00	0.12-0.16	Low------	---	0.43	0.43			
837C:												
Village---------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	4	5	56
	8-36	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	36-57	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	57-60	15-40	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
837C2:												
Village---------	0-7	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	1.5-2.5	0.37	0.37	4	5	56
	7-34	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	34-53	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	53-60	15-40	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
837D:												
Village---------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	4	5	56
	8-36	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	36-57	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	57-60	15-40	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
837D2:												
Village---------	0-7	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	1.5-2.5	0.37	0.37	4	5	56
	7-34	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	34-53	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	53-60	15-40	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
837E:												
Village---------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	4	5	56
	8-36	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	36-57	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	57-60	15-40	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
837E2:												
Village---------	0-7	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	1.5-2.5	0.37	0.37	4	5	56
	7-34	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	34-53	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	53-60	15-40	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
837F:												
Village---------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	4	5	56
	8-36	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	36-57	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	57-60	15-40	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
838C2:												
Allamakee-------	0-6	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.32	0.32	4	5	56
	6-22	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	22-29	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	29-45	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	45-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
838D:												
Allamakee-------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.5-3.5	0.32	0.32	4	5	56
	8-27	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	27-32	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	32-48	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	48-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
838D2:												
Allamakee-------	0-6	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.32	0.32	4	5	56
	6-22	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	22-29	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	29-45	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	45-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
838E2:												
Allamakee-------	0-6	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.32	0.32	4	5	56
	6-22	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	22-29	45-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	29-45	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	45-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
840E:												
Lacrescent------	0-12	18-27	1.25-1.35	0.60-2.00	0.18-0.24	Low------	3.0-5.0	0.28	0.28	3	6	48
	12-44	8-23	1.30-1.50	0.60-6.00	0.06-0.09	Low------	---	0.32	0.43			
	44-60	8-20	1.30-1.50	2.00-6.00	0.05-0.08	Low------	---	0.32	0.32			
840F:												
Lacrescent------	0-12	18-27	1.25-1.35	0.60-2.00	0.18-0.24	Low------	3.0-5.0	0.28	0.28	3	6	48
	12-44	8-23	1.30-1.50	0.60-6.00	0.06-0.09	Low------	---	0.32	0.43			
	44-60	8-20	1.30-1.50	2.00-6.00	0.05-0.08	Low------	---	0.32	0.32			
840G:												
Lacrescent------	0-12	18-27	1.25-1.35	0.60-2.00	0.18-0.24	Low------	3.0-5.0	0.28	0.28	3	6	48
	12-44	8-23	1.30-1.50	0.60-6.00	0.06-0.09	Low------	---	0.32	0.43			
	44-60	8-20	1.30-1.50	2.00-6.00	0.05-0.08	Low------	---	0.32	0.32			
841G:												
Rock outcrop----	0-60	---	---	---	---	---	---	---	---	---	8	---
Boone-----------	0-6	2-6	1.55-1.65	6.00-20.00	0.10-0.13	Low------	0.5-1.5	0.17	0.17	3	2	134
	6-24	0-3	1.55-1.70	6.00-20.00	0.04-0.11	Low------	0.0-0.5	0.15	0.15			
	24-60	---	---	0.20-2.00	---	---	---	---	---			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
843:												
Elon------------	0-60	10-18	1.25-1.30	0.60-2.00	0.20-0.22	Moderate	2.0-3.0	0.37	0.37	5	4L	86
861D:												
Yellowriver-----	0-12	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.37	0.37	5	6	48
	12-40	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
861D2:												
Yellowriver-----	0-12	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	1.5-2.5	0.37	0.37	5	6	48
	12-40	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
861E:												
Yellowriver-----	0-12	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.37	0.37	5	6	48
	12-40	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
861E2:												
Yellowriver-----	0-12	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	1.5-2.5	0.37	0.37	5	6	48
	12-40	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
861F:												
Yellowriver-----	0-12	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.37	0.37	5	6	48
	12-40	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
861G:												
Yellowriver-----	0-12	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.37	0.37	5	6	48
	12-40	20-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
862D:												
Churchtown------	0-17	15-26	1.35-1.40	0.60-2.00	0.20-0.22	Low------	2.5-3.5	0.32	0.32	5	6	48
	17-44	20-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	44-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
862D2:												
Churchtown------	0-17	15-26	1.35-1.40	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	17-44	20-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	44-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
862E:												
Churchtown------	0-17	15-26	1.35-1.40	0.60-2.00	0.20-0.22	Low------	2.5-3.5	0.32	0.32	5	6	48
	17-44	20-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	44-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
862E2:												
Churchtown------	0-17	15-26	1.35-1.40	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	17-44	20-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	44-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
862F:												
Churchtown------	0-17	15-26	1.35-1.40	0.60-2.00	0.20-0.22	Low------	2.5-3.5	0.32	0.32	5	6	48
	17-44	20-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	44-60	22-26	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
903C2:												
Frankville------	0-7	18-25	1.30-1.35	0.60-2.00	0.21-0.23	Moderate	2.0-3.0	0.37	0.37	3	6	48
	7-25	23-32	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	25-31	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.32	0.32			
	31-60	---	---	0.00-0.06	---	---	---	---	---			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
903D:												
Frankville------	0-7	18-25	1.30-1.35	0.60-2.00	0.21-0.23	Moderate	2.5-3.5	0.32	0.32	3	6	48
	7-26	23-32	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	26-33	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.32	0.32			
	33-60	---	---	0.00-0.06	---	---	---	---	---			
903D2:												
Frankville------	0-7	18-25	1.30-1.35	0.60-2.00	0.21-0.23	Moderate	2.0-3.0	0.37	0.37	3	6	48
	7-25	23-32	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	25-31	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.32	0.32			
	31-60	---	---	0.00-0.06	---	---	---	---	---			
903E2:												
Frankville------	0-7	18-25	1.30-1.35	0.60-2.00	0.21-0.23	Moderate	2.0-3.0	0.37	0.37	3	6	48
	7-25	23-32	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	25-31	40-55	1.50-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.32	0.32			
	31-60	---	---	0.00-0.06	---	---	---	---	---			
912C:												
Paintcreek------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	3	5	56
	8-15	20-30	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	15-35	35-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	35-55	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	55-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
912D:												
Paintcreek------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	3	5	56
	8-15	20-30	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	15-35	35-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	35-55	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	55-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
912D2:												
Paintcreek------	0-6	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	1.5-2.5	0.37	0.37	3	5	56
	6-11	20-30	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	11-31	35-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	31-51	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	51-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
912E:												
Paintcreek------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	3	5	56
	8-15	20-30	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	15-35	35-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	35-55	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	55-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
912E2:												
Paintcreek------	0-6	18-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	1.5-2.5	0.37	0.37	3	5	56
	6-11	20-30	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
	11-31	35-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	31-51	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	51-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			
912F:												
Paintcreek------	0-8	12-25	1.25-1.40	0.60-2.00	0.21-0.23	Low------	2.0-3.0	0.37	0.37	3	5	56
	8-15	20-30	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	15-35	35-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.28	0.28			
	35-55	50-70	1.25-1.45	0.06-0.20	0.10-0.15	High-----	0.0-0.5	0.20	0.28			
	55-60	15-50	1.20-1.35	0.20-0.60	0.10-0.15	Moderate	0.0-0.5	0.20	0.20			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
930:												
Orion-----------	0-8	10-18	1.20-1.30	0.60-2.00	0.22-0.24	Low------	1.0-3.0	0.37	0.37	5	5	56
	8-28	10-18	1.20-1.30	0.60-2.00	0.20-0.22	Low------	1.0-3.0	0.37	0.37			
	28-49	10-30	1.25-1.45	0.60-2.00	0.18-0.22	Low------	3.0-8.0	0.37	0.37			
	49-60	10-18	1.20-1.40	0.60-2.00	0.18-0.22	Low------	0.0-0.5	0.37	0.37			
951G:												
Medary----------	0-4	15-27	1.35-1.60	0.60-2.00	0.22-0.24	Low------	1.5-2.5	0.37	0.37	5	5	56
	4-8	25-40	1.55-1.65	0.20-0.60	0.18-0.22	Moderate	0.5-1.0	0.37	0.37			
	8-26	40-60	1.60-1.70	0.06-0.20	0.09-0.13	High-----	0.0-0.5	0.28	0.28			
	26-60	25-50	1.30-1.60	0.06-0.20	0.12-0.20	High-----	0.0-0.5	0.28	0.28			
977:												
Richwood--------	0-16	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	3.5-4.5	0.28	0.28	4	5	56
	16-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	0.5-1.0	0.43	0.43			
977B:												
Richwood--------	0-16	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	3.0-4.0	0.28	0.28	4	5	56
	16-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	0.5-1.0	0.43	0.43			
978B:												
Festina---------	0-11	18-24	1.30-1.35	0.60-2.00	0.22-0.24	Low------	2.5-3.5	0.28	0.28	5	6	48
	11-38	24-29	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	38-60	22-26	1.40-1.45	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
978C:												
Festina---------	0-11	18-24	1.30-1.35	0.60-2.00	0.22-0.24	Low------	2.5-3.5	0.28	0.28	5	6	48
	11-38	24-29	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	38-60	22-26	1.40-1.45	0.60-2.00	0.20-0.22	Moderate	0.0-0.5	0.43	0.43			
981B:												
Worthen---------	0-34	15-22	1.20-1.40	0.60-2.00	0.22-0.24	Low------	3.5-4.5	0.32	0.32	5	6	48
	34-60	18-24	1.20-1.40	0.60-2.00	0.20-0.22	Low------	0.2-1.0	0.43	0.43			
1120D:												
Lycurgus--------	0-13	15-24	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	2.0-4.0	0.28	0.28	5	6	48
	13-60	20-35	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-2.0	0.43	0.43			
1120E:												
Lycurgus--------	0-13	15-24	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	2.0-4.0	0.28	0.28	5	6	48
	13-60	20-35	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-2.0	0.43	0.43			
1120F:												
Lycurgus--------	0-13	15-24	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	2.0-4.0	0.28	0.28	5	6	48
	13-60	20-35	1.35-1.40	0.60-2.00	0.20-0.22	Moderate	0.0-2.0	0.43	0.43			
1490:												
Caneek----------	0-31	18-24	1.20-1.30	0.60-2.00	0.20-0.22	Low------	0.7-1.7	0.37	0.37	5	4L	86
	31-60	18-28	1.25-1.40	0.60-2.00	0.22-0.24	Moderate	0.0-0.5	0.37	0.37			
1496:												
Arenzville------	0-23	10-18	1.20-1.55	0.60-2.00	0.20-0.24	Low------	1.5-2.5	0.37	0.37	5	5	56
	23-60	10-30	1.25-1.45	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
Volney----------	0-6	18-24	1.40-1.55	2.00-6.00	0.13-0.16	Low------	3.0-5.0	0.24	0.43	4	8	---
	6-60	12-25	1.70-1.90	>20.00	0.02-0.08	Low------	0.0-1.0	0.24	0.43			
1496B:												
Arenzville------	0-23	10-18	1.20-1.55	0.60-2.00	0.20-0.24	Low------	1.5-2.5	0.37	0.37	5	5	56
	23-60	10-30	1.25-1.45	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
Volney----------	0-6	18-24	1.40-1.55	2.00-6.00	0.13-0.16	Low------	3.0-5.0	0.24	0.43	4	8	---
	6-60	12-25	1.70-1.90	>20.00	0.02-0.08	Low------	0.0-1.0	0.24	0.43			

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
1793G:												
Bertrand--------	0-10	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	4	5	56
	10-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	---	0.37	0.37			
Chelsea---------	0-3	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	1.0-2.0	0.17	0.17	5	2	134
	3-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
2670:												
Ion-------------	0-36	10-18	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	2.0-4.0	0.32	0.32	5	4L	86
	36-60	12-22	1.35-1.40	0.60-2.00	0.19-0.21	Moderate	3.0-4.0	0.32	0.32			
5010, 5030. Pits												
5040. Orthents												

CHEMICAL PROPERTIES OF THE SOILS

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
40D:					
Fayette	0-13	15-27	15.0-20.0	5.1-7.3	---
	13-51	25-35	15.0-20.0	4.5-6.5	---
	51-60	22-26	15.0-20.0	5.1-7.8	0-15
41B:					
Sparta	0-23	1-5	1.0-8.0	5.1-7.3	---
	23-38	1-8	1.0-6.0	5.1-7.3	---
	38-60	0-5	1.0-4.0	5.1-7.8	---
41C:					
Sparta	0-23	1-5	1.0-8.0	5.1-7.3	---
	23-38	1-8	1.0-6.0	5.1-7.3	---
	38-60	0-5	1.0-4.0	5.1-7.8	---
41D:					
Sparta	0-23	1-5	1.0-8.0	5.1-7.3	---
	23-38	1-8	1.0-6.0	5.1-7.3	---
	38-60	0-5	1.0-4.0	5.1-7.8	---
63B:					
Chelsea	0-3	8-15	5.0-10.0	5.6-7.3	---
	3-60	5-10	5.0-10.0	5.1-6.5	---
63C:					
Chelsea	0-3	8-15	5.0-10.0	5.6-7.3	---
	3-60	5-10	5.0-10.0	5.1-6.5	---
63D:					
Chelsea	0-3	8-15	5.0-10.0	5.6-7.3	---
	3-60	5-10	5.0-10.0	5.1-6.5	---
63E:					
Chelsea	0-3	8-15	5.0-10.0	5.6-7.3	---
	3-60	5-10	5.0-10.0	5.1-6.5	---
63F:					
Chelsea	0-3	8-15	5.0-10.0	5.6-7.3	---
	3-60	5-10	5.0-10.0	5.1-6.5	---
63G:					
Chelsea	0-3	8-15	5.0-10.0	5.6-7.3	---
	3-60	5-10	5.0-10.0	5.1-6.5	---
85:					
Eitzen	0-30	18-25	---	5.6-7.3	---
	30-53	18-27	---	5.1-6.5	---
	53-60	18-27	---	5.1-6.0	---
85B:					
Eitzen	0-30	18-25	---	5.6-7.3	---
	30-53	18-27	---	5.1-6.5	---
	53-60	18-27	---	5.1-6.0	---
98:					
Huntsville	0-39	18-27	17.0-24.0	5.6-7.8	---
	39-60	18-27	11.0-17.0	5.6-7.8	---
98B:					
Huntsville	0-39	18-27	17.0-24.0	5.6-7.8	---
	39-60	18-27	11.0-17.0	5.6-7.8	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
118:					
Garwin----------	0-20	30-35	36.0-41.0	5.6-7.3	---
	20-24	27-35	36.0-41.0	6.1-7.3	---
	24-60	20-26	30.0-36.0	6.6-7.8	0-15
119B:					
Muscatine-------	0-10	24-27	30.0-36.0	5.1-7.3	---
	10-34	30-35	30.0-36.0	5.1-7.3	---
	34-60	22-30	30.0-36.0	6.6-7.8	0-15
120B:					
Tama------------	0-18	24-27	25.0-30.0	5.1-7.3	---
	18-44	27-35	25.0-30.0	5.1-6.5	---
	44-60	22-28	25.0-30.0	5.6-7.3	---
120C:					
Tama------------	0-18	24-27	25.0-30.0	5.1-7.3	---
	18-44	27-35	25.0-30.0	5.1-6.5	---
	44-60	22-28	25.0-30.0	5.6-7.3	---
129B:					
Arenzville------	0-23	10-18	---	5.6-7.8	---
	23-60	10-30	---	5.6-7.8	---
Chaseburg-------	0-18	12-16	---	6.1-7.8	---
	18-60	10-18	---	5.6-7.8	---
140B:					
Sparta----------	0-35	3-10	2.0-12.0	5.1-7.3	---
	35-50	1-8	1.0-6.0	5.1-7.3	---
	50-60	0-5	1.0-4.0	5.1-7.8	---
140C:					
Sparta----------	0-35	3-10	2.0-12.0	5.1-7.3	---
	35-47	1-8	1.0-6.0	5.1-7.3	---
	47-60	0-5	1.0-4.0	5.1-7.8	---
142:					
Chaseburg-------	0-18	12-16	---	6.1-7.8	---
	18-60	10-18	---	5.6-7.8	---
162B:					
Downs-----------	0-9	18-26	20.0-25.0	5.1-7.3	---
	9-56	26-35	20.0-25.0	4.5-7.3	---
	56-60	22-26	20.0-25.0	5.6-7.3	---
162B2:					
Downs-----------	0-9	18-26	20.0-25.0	5.1-7.3	---
	9-52	26-35	20.0-25.0	4.5-7.3	---
	52-60	22-26	20.0-25.0	5.6-7.3	---
162C:					
Downs-----------	0-9	18-26	20.0-25.0	5.1-7.3	---
	9-56	26-35	20.0-25.0	4.5-7.3	---
	56-60	22-26	20.0-25.0	5.6-7.3	---
162C2:					
Downs-----------	0-9	18-26	20.0-25.0	5.1-7.3	---
	9-52	26-35	20.0-25.0	4.5-7.3	---
	52-60	22-26	20.0-25.0	5.6-7.3	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
162D:					
Downs-----------	0-9	18-26	20.0-25.0	5.1-7.3	---
	9-56	26-35	20.0-25.0	4.5-7.3	---
	56-60	22-26	20.0-25.0	5.6-7.3	---
162D2:					
Downs-----------	0-9	18-26	20.0-25.0	5.1-7.3	---
	9-52	26-35	20.0-25.0	4.5-7.3	---
	52-60	22-26	20.0-25.0	5.6-7.3	---
162E2:					
Downs-----------	0-9	18-26	20.0-25.0	5.1-7.3	---
	9-52	26-35	20.0-25.0	4.5-7.3	---
	52-60	22-26	20.0-25.0	5.6-7.3	---
163B:					
Fayette---------	0-10	15-27	15.0-20.0	5.1-7.3	---
	10-51	25-35	15.0-20.0	4.5-6.5	---
	51-60	22-26	15.0-20.0	5.1-7.8	0-15
163B2:					
Fayette---------	0-8	25-27	18.0-25.0	5.1-7.3	---
	8-46	25-35	15.0-20.0	4.5-6.0	---
	46-60	22-26	15.0-20.0	5.1-7.8	0-15
163C:					
Fayette---------	0-10	15-27	15.0-20.0	5.1-7.3	---
	10-51	25-35	15.0-20.0	4.5-6.5	---
	51-60	22-26	15.0-20.0	5.1-7.8	0-15
163C2:					
Fayette---------	0-8	25-27	18.0-25.0	5.1-7.3	---
	8-46	25-35	15.0-20.0	4.5-6.0	---
	46-60	22-26	15.0-20.0	5.1-7.8	0-15
163D:					
Fayette---------	0-10	15-27	15.0-20.0	5.1-7.3	---
	10-51	25-35	15.0-20.0	4.5-6.5	---
	51-60	22-26	15.0-20.0	5.1-7.8	0-15
163D2:					
Fayette---------	0-8	25-27	18.0-25.0	5.1-7.3	---
	8-46	25-35	15.0-20.0	4.5-6.0	---
	46-60	22-26	15.0-20.0	5.1-7.8	0-15
163E:					
Fayette---------	0-10	15-27	15.0-20.0	5.1-7.3	---
	10-51	25-35	15.0-20.0	4.5-6.5	---
	51-60	22-26	15.0-20.0	5.1-7.8	0-15
163E2:					
Fayette---------	0-8	25-27	18.0-25.0	5.1-7.3	---
	8-46	25-35	15.0-20.0	4.5-6.0	---
	46-60	22-26	15.0-20.0	5.1-7.8	0-15
163F:					
Fayette---------	0-10	15-27	15.0-20.0	5.1-7.3	---
	10-51	25-35	15.0-20.0	4.5-6.5	---
	51-60	22-26	15.0-20.0	5.1-7.8	0-15

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
163G:					
Fayette----------	0-10	15-27	15.0-20.0	5.1-7.3	---
	10-51	25-35	15.0-20.0	4.5-6.5	---
	51-60	22-26	15.0-20.0	5.1-7.8	0-15
178B:					
Waukee-----------	0-22	18-24	20.0-25.0	5.1-7.3	---
	22-33	18-27	20.0-25.0	5.1-6.0	---
	33-60	2-8	5.0-10.0	5.6-6.5	---
196B:					
Volney-----------	0-6	18-24	20.0-25.0	7.9-8.4	15-30
	6-60	12-25	15.0-25.0	7.9-8.4	15-30
196C:					
Volney-----------	0-6	18-24	20.0-25.0	7.9-8.4	15-30
	6-60	12-25	15.0-25.0	7.9-8.4	15-30
206C:					
Shullsburg-------	0-13	27-35	---	5.6-7.3	---
	13-32	24-35	---	5.6-7.3	---
	32-60	40-70	---	6.1-7.8	---
210E:					
Boone------------	0-6	2-6	0.0-7.0	3.6-7.3	---
	6-24	0-3	0.0-3.0	3.6-7.3	---
	24-60	---	---	---	---
210F:					
Boone------------	0-6	2-6	0.0-7.0	3.6-7.3	---
	6-24	0-3	0.0-3.0	3.6-7.3	---
	24-60	---	---	---	---
210G:					
Boone------------	0-6	2-6	0.0-7.0	3.6-7.3	---
	6-24	0-3	0.0-3.0	3.6-7.3	---
	24-60	---	---	---	---
249C:					
Zwingle----------	0-11	18-27	15.0-20.0	4.5-7.3	---
	11-41	38-60	25.0-36.0	4.5-6.5	---
	41-60	8-20	10.0-15.0	6.1-6.5	---
291:					
Atterberry-------	0-25	20-26	16.0-24.0	5.6-7.3	---
	25-51	15-26	10.0-18.0	5.1-7.3	---
	51-60	25-35	15.0-22.0	5.1-7.3	---
320:					
Arenzville-------	0-23	10-18	---	5.6-7.8	---
	23-60	10-30	---	5.6-7.8	---
478G:					
Nordness---------	0-5	18-24	15.0-20.0	5.6-7.3	---
	5-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---
Rock outcrop.					

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
484:					
Lawson----------	0-9	10-27	11.0-28.0	6.1-7.8	---
	9-32	10-30	11.0-29.0	6.1-7.8	---
	32-60	18-30	11.0-23.0	6.1-7.8	---
485:					
Spillville------	0-47	18-26	20.0-25.0	5.6-7.3	---
	47-60	14-24	20.0-25.0	5.6-7.3	---
487B:					
Otter-----------	0-25	18-27	16.0-36.0	6.1-7.8	---
	25-60	18-27	12.0-22.0	6.1-7.8	---
Worthen---------	0-34	15-22	15.0-21.0	5.6-7.3	---
	34-60	18-24	11.0-14.0	5.6-7.8	---
490:					
Caneek----------	0-31	18-24	20.0-25.0	7.4-8.4	5-30
	31-60	18-28	20.0-25.0	6.6-7.3	---
499C:					
Nordness--------	0-5	18-24	15.0-20.0	5.6-7.3	---
	5-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---
499D:					
Nordness--------	0-5	18-24	15.0-20.0	5.6-7.3	---
	5-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---
499D2:					
Nordness--------	0-9	18-24	15.0-20.0	5.6-7.3	---
	9-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---
499E:					
Nordness--------	0-5	18-24	15.0-20.0	5.6-7.3	---
	5-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---
499E2:					
Nordness--------	0-9	18-24	15.0-20.0	5.6-7.3	---
	9-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---
499F:					
Nordness--------	0-5	18-24	15.0-20.0	5.6-7.3	---
	5-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---
499G:					
Nordness--------	0-5	18-24	15.0-20.0	5.6-7.3	---
	5-14	22-29	15.0-20.0	5.6-7.3	---
	14-15	22-35	20.0-25.0	6.6-7.3	---
	15-60	---	---	---	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
589:					
Otter-----------	0-25	18-27	16.0-36.0	6.1-7.8	---
	25-60	18-27	12.0-22.0	6.1-7.8	---
703C:					
Dubuque---------	0-7	15-27	15.0-20.0	5.1-7.3	---
	7-27	26-35	15.0-20.0	5.1-6.0	---
	27-28	40-55	41.0-45.0	5.1-6.0	---
	28-60	---	---	---	---
703C2:					
Dubuque---------	0-9	15-27	15.0-20.0	5.1-7.3	---
	9-24	26-35	15.0-20.0	5.1-6.0	---
	24-25	40-55	41.0-45.0	5.1-6.0	---
	25-60	---	---	---	---
703D:					
Dubuque---------	0-7	15-27	15.0-20.0	5.1-7.3	---
	7-27	26-35	15.0-20.0	5.1-6.0	---
	27-28	40-55	41.0-45.0	5.1-6.0	---
	28-60	---	---	---	---
703D2:					
Dubuque---------	0-9	15-27	15.0-20.0	5.1-7.3	---
	9-24	26-35	15.0-20.0	5.1-6.0	---
	24-25	40-55	41.0-45.0	5.1-6.0	---
	25-60	---	---	---	---
703E:					
Dubuque---------	0-7	15-27	15.0-20.0	5.1-7.3	---
	7-27	26-35	15.0-20.0	5.1-6.0	---
	27-28	40-55	41.0-45.0	5.1-6.0	---
	28-60	---	---	---	---
703E2:					
Dubuque---------	0-9	15-27	15.0-20.0	5.1-7.3	---
	9-24	26-35	15.0-20.0	5.1-6.0	---
	24-25	40-55	41.0-45.0	5.1-6.0	---
	25-60	---	---	---	---
703F:					
Dubuque---------	0-7	15-27	15.0-20.0	5.1-7.3	---
	7-27	26-35	15.0-20.0	5.1-6.0	---
	27-28	40-55	41.0-45.0	5.1-6.0	---
	28-60	---	---	---	---
721C:					
Massbach--------	0-9	22-27	17.0-24.0	5.6-7.3	---
	9-35	25-35	16.0-23.0	5.6-7.8	---
	35-60	---	---	---	---
721D:					
Massbach--------	0-9	22-27	17.0-24.0	5.6-7.3	---
	9-35	25-35	16.0-23.0	5.6-7.8	---
	35-60	---	---	---	---
740C:					
Hawick----------	0-10	2-10	1.0-10.0	6.1-7.8	0-10
	10-60	1-5	1.0-5.0	7.4-8.4	5-15
740G:					
Hawick----------	0-10	2-10	1.0-10.0	6.1-7.8	0-10
	10-60	1-5	1.0-5.0	7.4-8.4	5-15

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
778B:					
Sattre----------	0-9	18-24	20.0-25.0	6.1-7.3	---
	9-31	18-28	20.0-25.0	5.1-7.3	---
	31-60	2-8	3.0-10.0	5.1-6.5	---
793B:					
Bertrand--------	0-10	15-22	---	5.6-7.3	---
	10-60	18-30	---	5.1-6.5	---
793C:					
Bertrand--------	0-10	15-22	---	5.6-7.3	---
	10-60	18-30	---	5.1-6.5	---
793D2:					
Bertrand--------	0-10	15-22	---	5.6-7.3	---
	10-60	18-30	---	5.1-6.5	---
793E:					
Bertrand--------	0-10	15-22	---	5.6-7.3	---
	10-60	18-30	---	5.1-6.5	---
826:					
Rowley----------	0-18	15-22	---	5.1-7.3	---
	18-22	20-30	---	5.1-7.3	---
	22-60	10-20	---	5.1-7.3	---
837C:					
Village---------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-36	20-35	15.0-25.0	4.5-6.5	---
	36-57	45-70	15.0-30.0	3.6-6.0	---
	57-60	15-40	15.0-25.0	5.1-7.3	---
837C2:					
Village---------	0-7	18-25	15.0-25.0	5.1-7.3	---
	7-34	20-35	15.0-25.0	4.5-6.5	---
	34-53	45-70	15.0-30.0	3.6-6.0	---
	53-60	15-40	15.0-25.0	5.1-7.3	---
837D:					
Village---------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-36	20-35	15.0-25.0	4.5-6.5	---
	36-57	45-70	15.0-30.0	3.6-6.0	---
	57-60	15-40	15.0-25.0	5.1-7.3	---
837D2:					
Village---------	0-7	18-25	15.0-25.0	5.1-7.3	---
	7-34	20-35	15.0-25.0	4.5-6.5	---
	34-53	45-70	15.0-30.0	3.6-6.0	---
	53-60	15-40	15.0-25.0	5.1-7.3	---
837E:					
Village---------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-36	20-35	15.0-25.0	4.5-6.5	---
	36-57	45-70	15.0-30.0	3.6-6.0	---
	57-60	15-40	15.0-25.0	5.1-7.3	---
837E2:					
Village---------	0-7	18-25	15.0-25.0	5.1-7.3	---
	7-34	20-35	15.0-25.0	4.5-6.5	---
	34-53	45-70	15.0-30.0	3.6-6.0	---
	53-60	15-40	15.0-25.0	5.1-7.3	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
837F:					
Village---------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-36	20-35	15.0-25.0	4.5-6.5	---
	36-57	45-70	15.0-30.0	3.6-6.0	---
	57-60	15-40	15.0-25.0	5.1-7.3	---
838C2:					
Allamakee-------	0-6	18-25	15.0-25.0	5.1-7.3	---
	6-22	20-35	15.0-25.0	4.5-6.5	---
	22-29	45-70	15.0-30.0	3.6-6.0	---
	29-45	50-70	15.0-30.0	3.6-6.0	---
	45-60	15-50	15.0-25.0	5.1-7.3	---
838D:					
Allamakee-------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-27	20-35	15.0-25.0	4.5-6.5	---
	27-32	45-70	15.0-30.0	3.6-6.0	---
	32-48	50-70	15.0-30.0	3.6-6.0	---
	48-60	15-50	15.0-25.0	5.1-7.3	---
838D2:					
Allamakee-------	0-6	18-25	15.0-25.0	5.1-7.3	---
	6-22	20-35	15.0-25.0	4.5-6.5	---
	22-29	45-70	15.0-30.0	3.6-6.0	---
	29-45	50-70	15.0-30.0	3.6-6.0	---
	45-60	15-50	15.0-25.0	5.1-7.3	---
838E2:					
Allamakee-------	0-6	18-25	15.0-25.0	5.1-7.3	---
	6-22	20-35	15.0-25.0	4.5-6.5	---
	22-29	45-70	15.0-30.0	3.6-6.0	---
	29-45	50-70	15.0-30.0	3.6-6.0	---
	45-60	15-50	15.0-25.0	5.1-7.3	---
840E:					
Lacrescent------	0-12	18-27	---	6.6-7.3	---
	12-44	8-23	---	6.6-7.3	---
	44-60	8-20	---	7.4-7.8	---
840F:					
Lacrescent------	0-12	18-27	---	6.6-7.3	---
	12-44	8-23	---	6.6-7.3	---
	44-60	8-20	---	7.4-7.8	---
840G:					
Lacrescent------	0-12	18-27	---	6.6-7.3	---
	12-44	8-23	---	6.6-7.3	---
	44-60	8-20	---	7.4-7.8	---
841G:					
Rock outcrop.					
Boone-----------	0-6	2-6	0.0-7.0	3.6-7.3	---
	6-24	0-3	0.0-3.0	3.6-7.3	---
	24-60	---	---	---	---
843:					
Elon------------	0-60	10-18	25.0-30.0	7.4-8.4	5-30
861D:					
Yellowriver-----	0-12	15-27	15.0-20.0	6.1-7.8	0-10
	12-40	20-35	15.0-20.0	6.1-7.8	0-10
	40-60	22-26	15.0-20.0	6.1-7.8	0-15

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
861D2:					
Yellowriver-----	0-12	15-27	15.0-20.0	6.1-7.8	0-10
	12-40	20-35	15.0-20.0	6.1-7.8	0-10
	40-60	22-26	15.0-20.0	6.1-7.8	0-15
861E:					
Yellowriver-----	0-12	15-27	15.0-20.0	6.1-7.8	0-10
	12-40	20-35	15.0-20.0	6.1-7.8	0-10
	40-60	22-26	15.0-20.0	6.1-7.8	0-15
861E2:					
Yellowriver-----	0-12	15-27	15.0-20.0	6.1-7.8	0-10
	12-40	20-35	15.0-20.0	6.1-7.8	0-10
	40-60	22-26	15.0-20.0	6.1-7.8	0-15
861F:					
Yellowriver-----	0-12	15-27	15.0-20.0	6.1-7.8	0-10
	12-40	20-35	15.0-20.0	6.1-7.8	0-10
	40-60	22-26	15.0-20.0	6.1-7.8	0-15
861G:					
Yellowriver-----	0-12	15-27	15.0-20.0	6.1-7.8	0-10
	12-40	20-35	15.0-20.0	6.1-7.8	0-10
	40-60	22-26	15.0-20.0	6.1-7.8	0-15
862D:					
Churchtown------	0-17	15-26	20.0-25.0	6.1-7.3	---
	17-44	20-35	20.0-25.0	6.1-7.3	---
	44-60	22-26	20.0-25.0	6.1-7.3	---
862D2:					
Churchtown------	0-17	15-26	20.0-25.0	6.1-7.3	---
	17-44	20-35	20.0-25.0	6.1-7.3	---
	44-60	22-26	20.0-25.0	6.1-7.3	---
862E:					
Churchtown------	0-17	15-26	20.0-25.0	6.1-7.3	---
	17-44	20-35	20.0-25.0	6.1-7.3	---
	44-60	22-26	20.0-25.0	6.1-7.3	---
862E2:					
Churchtown------	0-17	15-26	20.0-25.0	6.1-7.3	---
	17-44	20-35	20.0-25.0	6.1-7.3	---
	44-60	22-26	20.0-25.0	6.1-7.3	---
862F:					
Churchtown------	0-17	15-26	20.0-25.0	6.1-7.3	---
	17-44	20-35	20.0-25.0	6.1-7.3	---
	44-60	22-26	20.0-25.0	6.1-7.3	---
903C2:					
Frankville------	0-7	18-25	20.0-25.0	6.6-7.3	---
	7-25	23-32	20.0-25.0	5.6-6.5	---
	25-31	40-55	41.0-50.0	6.1-7.3	---
	31-60	---	---	---	---
903D:					
Frankville------	0-7	18-25	20.0-25.0	6.6-7.3	---
	7-26	23-32	20.0-25.0	5.6-6.5	---
	26-33	40-55	20.0-25.0	6.1-7.3	---
	33-60	---	41.0-50.0	---	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
903D2:					
Frankville------	0-7	18-25	20.0-25.0	6.6-7.3	---
	7-25	23-32	20.0-25.0	5.6-6.5	---
	25-31	40-55	41.0-50.0	6.1-7.3	---
	31-60	---	---	---	---
903E2:					
Frankville------	0-7	18-25	20.0-25.0	6.6-7.3	---
	7-25	23-32	20.0-25.0	5.6-6.5	---
	25-31	40-55	41.0-50.0	6.1-7.3	---
	31-60	---	---	---	---
912C:					
Paintcreek------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-15	20-30	15.0-25.0	4.5-6.5	---
	15-35	35-70	15.0-30.0	3.6-6.0	---
	35-55	50-70	15.0-30.0	3.6-6.0	---
	55-60	15-50	15.0-25.0	5.1-7.3	---
912D:					
Paintcreek------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-15	20-30	15.0-25.0	4.5-6.5	---
	15-35	35-70	15.0-30.0	3.6-6.0	---
	35-55	50-70	15.0-30.0	3.6-6.0	---
	55-60	15-50	15.0-25.0	5.1-7.3	---
912D2:					
Paintcreek------	0-6	18-25	15.0-25.0	5.1-7.3	---
	6-11	20-30	15.0-25.0	4.5-6.5	---
	11-31	35-70	15.0-30.0	3.6-6.0	---
	31-51	50-70	15.0-30.0	3.6-6.0	---
	51-60	15-50	15.0-25.0	5.1-7.3	---
912E:					
Paintcreek------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-15	20-30	15.0-25.0	4.5-6.5	---
	15-35	35-70	15.0-30.0	3.6-6.0	---
	35-55	50-70	15.0-30.0	3.6-6.0	---
	55-60	15-50	15.0-25.0	5.1-7.3	---
912E2:					
Paintcreek------	0-6	18-25	15.0-25.0	5.1-7.3	---
	6-11	20-30	15.0-25.0	4.5-6.5	---
	11-31	35-70	15.0-30.0	3.6-6.0	---
	31-51	50-70	15.0-30.0	3.6-6.0	---
	51-60	15-50	15.0-25.0	5.1-7.3	---
912F:					
Paintcreek------	0-8	12-25	15.0-25.0	5.1-7.3	---
	8-15	20-30	15.0-25.0	4.5-6.5	---
	15-35	35-70	15.0-30.0	3.6-6.0	---
	35-55	50-70	15.0-30.0	3.6-6.0	---
	55-60	15-50	15.0-25.0	5.1-7.3	---
930:					
Orion-----------	0-8	10-18	7.0-20.0	5.6-7.8	---
	8-28	10-18	7.0-20.0	5.6-7.8	---
	28-49	10-30	10.0-35.0	5.6-7.8	---
	49-60	10-18	5.0-15.0	5.6-7.8	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
951G:					
Medary----------	0-4	15-27	5.0-25.0	5.1-6.5	---
	4-8	25-40	6.0-35.0	4.5-6.0	---
	8-26	40-60	8.0-50.0	5.1-7.3	---
	26-60	25-50	5.0-40.0	5.1-7.8	0-15
977:					
Richwood--------	0-16	15-22	7.0-30.0	5.6-7.3	---
	16-60	18-30	4.0-25.0	5.6-7.3	---
977B:					
Richwood--------	0-16	15-22	7.0-30.0	5.6-7.3	---
	16-60	18-30	4.0-25.0	5.6-7.3	---
978B:					
Festina---------	0-11	18-24	20.0-25.0	5.6-7.3	---
	11-38	24-29	20.0-25.0	5.1-6.0	---
	38-60	22-26	20.0-25.0	5.1-6.5	---
978C:					
Festina---------	0-11	18-24	20.0-25.0	5.6-7.3	---
	11-38	24-29	20.0-25.0	5.1-6.0	---
	38-60	22-26	20.0-25.0	5.1-6.5	---
981B:					
Worthen---------	0-34	15-22	15.0-21.0	5.6-7.3	---
	34-60	18-24	11.0-14.0	5.6-7.8	---
1120D:					
Lycurgus--------	0-13	15-24	25.0-30.0	6.1-7.3	---
	13-60	20-35	25.0-30.0	6.1-7.3	---
1120E:					
Lycurgus--------	0-13	15-24	25.0-30.0	6.1-7.3	---
	13-60	20-35	25.0-30.0	6.1-7.3	---
1120F:					
Lycurgus--------	0-13	15-24	25.0-30.0	6.1-7.3	---
	13-60	20-35	25.0-30.0	6.1-7.3	---
1490:					
Caneek----------	0-31	18-24	20.0-25.0	7.4-8.4	5-30
	31-60	18-28	20.0-25.0	6.6-7.3	---
1496:					
Arenzville------	0-23	10-18	---	5.6-7.8	---
	23-60	10-30	---	5.6-7.8	---
Volney----------	0-6	18-24	20.0-25.0	7.9-8.4	15-30
	6-60	12-25	15.0-25.0	7.9-8.4	15-30
1496B:					
Arenzville------	0-23	10-18	---	5.6-7.8	---
	23-60	10-30	---	5.6-7.8	---
Volney----------	0-6	18-24	20.0-25.0	7.9-8.4	15-30
	6-60	12-25	15.0-25.0	7.9-8.4	15-30
1793G:					
Bertrand--------	0-10	15-22	---	5.6-7.3	---
	10-60	18-30	---	5.1-6.5	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
1793G:					
Chelsea---------	0-3	8-15	5.0-10.0	5.6-7.3	---
	4-60	5-10	5.0-10.0	5.1-6.5	---
2670:					
Ion-------------	0-36	10-18	15.0-20.0	6.6-8.4	0-30
	36-60	12-22	20.0-25.0	6.1-7.8	0-20
5010, 5030.					
Pits					
5040.					
Orthents					

WATER FEATURES

Map symbol and soil name	Hydro-logic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
40D:							
Fayette	B	None	---	---	>6.0	---	---
41B:							
Sparta	A	None	---	---	>6.0	---	---
41C:							
Sparta	A	None	---	---	>6.0	---	---
41D:							
Sparta	A	None	---	---	>6.0	---	---
63B:							
Chelsea	A	None	---	---	>6.0	---	---
63C:							
Chelsea	A	None	---	---	>6.0	---	---
63D:							
Chelsea	A	None	---	---	>6.0	---	---
63E:							
Chelsea	A	None	---	---	>6.0	---	---
63F:							
Chelsea	A	None	---	---	>6.0	---	---
63G:							
Chelsea	A	None	---	---	>6.0	---	---
85:							
Eitzen	B	Occasional	---	Apr-Nov	>6.0	---	---
85B:							
Eitzen	B	Occasional	---	Apr-Nov	>6.0	---	---
98:							
Huntsville	B	Occasional	Brief	Jan-Jun	>6.0	---	---
98B:							
Huntsville	B	Occasional	Brief	Jan-Jun	>6.0	---	---
118:							
Garwin	B/D	None	---	---	0.0-1.0	Apparent	Nov-Jul
119B:							
Muscatine	B	None	---	---	2.0-4.0	Apparent	Nov-Jul
120B:							
Tama	B	None	---	---	>6.0	---	---
120C:							
Tama	B	None	---	---	>6.0	---	---
129B:							
Arenzville	B	Occasional	Brief	Nov-Jun	>6.0	---	---
Chaseburg	B	Occasional	---	Nov-Jun	>6.0	---	---
140B:							
Sparta	A	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
140C:							
Sparta----------	A	None	---	---	>6.0	---	---
142:							
Chaseburg-------	B	Occasional	---	Nov-Jun	>6.0	---	---
162B:							
Downs-----------	B	None	---	---	>6.0	---	---
162B2:							
Downs-----------	B	None	---	---	>6.0	---	---
162C:							
Downs-----------	B	None	---	---	>6.0	---	---
162C2:							
Downs-----------	B	None	---	---	>6.0	---	---
162D:							
Downs-----------	B	None	---	---	>6.0	---	---
162D2:							
Downs-----------	B	None	---	---	>6.0	---	---
162E2:							
Downs-----------	B	None	---	---	>6.0	---	---
163B:							
Fayette---------	B	None	---	---	>6.0	---	---
163B2:							
Fayette---------	B	None	---	---	>6.0	---	---
163C:							
Fayette---------	B	None	---	---	>6.0	---	---
163C2:							
Fayette---------	B	None	---	---	>6.0	---	---
163D:							
Fayette---------	B	None	---	---	>6.0	---	---
163D2:							
Fayette---------	B	None	---	---	>6.0	---	---
163E:							
Fayette---------	B	None	---	---	>6.0	---	---
163E2:							
Fayette---------	B	None	---	---	>6.0	---	---
163F:							
Fayette---------	B	None	---	---	>6.0	---	---
163G:							
Fayette---------	B	None	---	---	>6.0	---	---
178B:							
Waukee----------	B	None	---	---	>6.0	---	---
196B:							
Volney----------	B	Occasional	---	Feb-Nov	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
196C:							
Volney	B	Occasional	---	Feb-Nov	>6.0	---	---
206C:							
Shullsburg	C	None	---	---	1.0-3.0	Perched	Nov-May
210E:							
Boone	A	None	---	---	>6.0	---	---
210F:							
Boone	A	None	---	---	>6.0	---	---
210G:							
Boone	A	None	---	---	>6.0	---	---
249C:							
Zwingle	D	None	---	---	0.0-1.0	Perched	Nov-Jul
291:							
Atterberry	B	None	---	---	1.0-3.0	Apparent	Mar-Jun
320:							
Arenzville	B	Occasional	Brief	Nov-Jun	>6.0	---	---
478G:							
Nordness	B	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
484:							
Lawson	C	Occasional	Long	Mar-Nov	1.0-3.0	Apparent	Nov-May
485:							
Spillville	B	Occasional	---	Feb-Nov	3.0-5.0	Apparent	Nov-Jul
487B:							
Otter	B/D	Occasional	Brief	Mar-Jun	0.0-1.0	Apparent	Nov-Jul
Worthen	B	None	---	---	>6.0	---	---
490:							
Caneek	B	Frequent	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jul
499C:							
Nordness	B	None	---	---	>6.0	---	---
499D:							
Nordness	B	None	---	---	>6.0	---	---
499D2:							
Nordness	B	None	---	---	>6.0	---	---
499E:							
Nordness	B	None	---	---	>6.0	---	---
499E2:							
Nordness	B	None	---	---	>6.0	---	---
499F:							
Nordness	B	None	---	---	>6.0	---	---
499G:							
Nordness	B	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
589:							
Otter	B/D	Occasional	Brief	Mar-Jun	0.0-1.0	Apparent	Nov-Jul
703C:							
Dubuque	B	None	---	---	>6.0	---	---
703C2:							
Dubuque	B	None	---	---	>6.0	---	---
703D:							
Dubuque	B	None	---	---	>6.0	---	---
703D2:							
Dubuque	B	None	---	---	>6.0	---	---
703E:							
Dubuque	B	None	---	---	>6.0	---	---
703E2:							
Dubuque	B	None	---	---	>6.0	---	---
703F:							
Dubuque	B	None	---	---	>6.0	---	---
721C:							
Massbach	B	None	---	---	3.0-5.0	Perched	Feb-Jun
721D:							
Massbach	B	None	---	---	3.0-5.0	Perched	Feb-Jun
740C:							
Hawick	A	None	---	---	>6.0	---	---
740G:							
Hawick	A	None	---	---	>6.0	---	---
778B:							
Sattre	B	None	---	---	>6.0	---	---
793B:							
Bertrand	B	None	---	---	>6.0	---	---
793C:							
Bertrand	B	None	---	---	>6.0	---	---
793D2:							
Bertrand	B	None	---	---	>6.0	---	---
793E:							
Bertrand	B	None	---	---	>6.0	---	---
826:							
Rowley	C	None	---	---	1.0-3.0	Apparent	Nov-May
837C:							
Village	B	None	---	---	>6.0	---	---
837C2:							
Village	B	None	---	---	>6.0	---	---
837D:							
Village	B	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Water table depth	High water table: Kind of water table	High water table: Months
					Ft		
837D2:							
Village	B	None	---	---	>6.0	---	---
837E:							
Village	B	None	---	---	>6.0	---	---
837E2:							
Village	B	None	---	---	>6.0	---	---
837F:							
Village	B	None	---	---	>6.0	---	---
838C2:							
Allamakee	B	None	---	---	>6.0	---	---
838D:							
Allamakee	B	None	---	---	>6.0	---	---
838D2:							
Allamakee	B	None	---	---	>6.0	---	---
838E2:							
Allamakee	B	None	---	---	>6.0	---	---
840E:							
Lacrescent	B	None	---	---	>6.0	---	---
840F:							
Lacrescent	B	None	---	---	>6.0	---	---
840G:							
Lacrescent	B	None	---	---	>6.0	---	---
841G:							
Rock outcrop	D	None	---	---	>6.0	---	---
Boone	A	None	---	---	>6.0	---	---
843:							
Elon	B	Occasional	Long	Feb-Nov	2.0-4.0	Apparent	Nov-Jul
861D:							
Yellowriver	B	None	---	---	>6.0	---	---
861D2:							
Yellowriver	B	None	---	---	>6.0	---	---
861E:							
Yellowriver	B	None	---	---	>6.0	---	---
861E2:							
Yellowriver	B	None	---	---	>6.0	---	---
861F:							
Yellowriver	B	None	---	---	>6.0	---	---
861G:							
Yellowriver	B	None	---	---	>6.0	---	---
862D:							
Churchtown	B	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Water table depth	High water table: Kind of water table	High water table: Months
					Ft		
862D2:							
Churchtown------	B	None	---	---	>6.0	---	---
862E:							
Churchtown------	B	None	---	---	>6.0	---	---
862E2:							
Churchtown------	B	None	---	---	>6.0	---	---
862F:							
Churchtown------	B	None	---	---	>6.0	---	---
903C2:							
Frankville------	B	None	---	---	>6.0	---	---
903D:							
Frankville------	B	None	---	---	>6.0	---	---
903D2:							
Frankville------	B	None	---	---	>6.0	---	---
903E2:							
Frankville------	B	None	---	---	>6.0	---	---
912C:							
Paintcreek------	C	None	---	---	>6.0	---	---
912D:							
Paintcreek------	C	None	---	---	>6.0	---	---
912D2:							
Paintcreek------	C	None	---	---	>6.0	---	---
912E:							
Paintcreek------	C	None	---	---	>6.0	---	---
912E2:							
Paintcreek------	C	None	---	---	>6.0	---	---
912F:							
Paintcreek------	C	None	---	---	>6.0	---	---
930:							
Orion-----------	C	Occasional	Brief	Mar-Nov	1.0-3.0	Apparent	Nov-May
951G:							
Medary----------	D	None	---	---	>6.0	---	---
977:							
Richwood--------	B	None	---	---	>6.0	---	---
977B:							
Richwood--------	B	None	---	---	>6.0	---	---
978B:							
Festina---------	B	None	---	---	>6.0	---	---
978C:							
Festina---------	B	None	---	---	>6.0	---	---
981B:							
Worthen---------	B	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
1120D:							
Lycurgus--------	B	None	---	---	>6.0	---	---
1120E:							
Lycurgus--------	B	None	---	---	>6.0	---	---
1120F:							
Lycurgus--------	B	None	---	---	>6.0	---	---
1490:							
Caneek----------	B	Frequent	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jul
1496:							
Arenzville------	B	Frequent	Brief	Nov-Jun	>6.0	---	---
Volney----------	B	Frequent	---	Feb-Nov	>6.0	---	---
1496B:							
Arenzville------	B	Frequent	Brief	Nov-Jun	>6.0	---	---
Volney----------	B	Frequent	---	Feb-Nov	>6.0	---	---
1793G:							
Bertrand--------	B	None	---	---	>6.0	---	---
Chelsea---------	A	None	---	---	>6.0	---	---
2670:							
Ion-------------	B	Occasional	Brief	Feb-Nov	>6.0	---	---
5010, 5030. Pits							
5040. Orthents							

SOIL FEATURES

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
40D: Fayette	>60	---	High	Moderate	Moderate.
41B: Sparta	>60	---	Low	Low	Moderate.
41C: Sparta	>60	---	Low	Low	Moderate.
41D: Sparta	>60	---	Low	Low	Moderate.
63B: Chelsea	>60	---	Low	Low	Low.
63C: Chelsea	>60	---	Low	Low	Low.
63D: Chelsea	>60	---	Low	Low	Low.
63E: Chelsea	>60	---	Low	Low	Low.
63F: Chelsea	>60	---	Low	Low	Low.
63G: Chelsea	>60	---	Low	Low	Low.
85: Eitzen	>60	---	High	Low	Moderate.
85B: Eitzen	>60	---	High	Low	Moderate.
98: Huntsville	>60	---	High	Low	Low.
98B: Huntsville	>60	---	High	Low	Low.
118: Garwin	>60	---	High	High	Moderate.
119B: Muscatine	>60	---	High	High	Moderate.
120B: Tama	>60	---	High	Moderate	Moderate.
120C: Tama	>60	---	High	Moderate	Moderate.
129B: Arenzville	>60	---	High	Moderate	Moderate.
Chaseburg	>60	---	High	Moderate	Moderate.
140B: Sparta	>60	---	Low	Low	Moderate.
140C: Sparta	>60	---	Low	Low	Moderate.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
142:					
Chaseburg	>60	---	High	Moderate	Moderate.
162B:					
Downs	>60	---	High	Moderate	Moderate.
162B2:					
Downs	>60	---	High	Moderate	Moderate.
162C:					
Downs	>60	---	High	Moderate	Moderate.
162C2:					
Downs	>60	---	High	Moderate	Moderate.
162D:					
Downs	>60	---	High	Moderate	Moderate.
162D2:					
Downs	>60	---	High	Moderate	Moderate.
162E2:					
Downs	>60	---	High	Moderate	Moderate.
163B:					
Fayette	>60	---	High	Moderate	Moderate.
163B2:					
Fayette	>60	---	High	Moderate	Moderate.
163C:					
Fayette	>60	---	High	Moderate	Moderate.
163C2:					
Fayette	>60	---	High	Moderate	Moderate.
163D:					
Fayette	>60	---	High	Moderate	Moderate.
163D2:					
Fayette	>60	---	High	Moderate	Moderate.
163E:					
Fayette	>60	---	High	Moderate	Moderate.
163E2:					
Fayette	>60	---	High	Moderate	Moderate.
163F:					
Fayette	>60	---	High	Moderate	Moderate.
163G:					
Fayette	>60	---	High	Moderate	Moderate.
178B:					
Waukee	>60	---	Low	Low	Moderate.
196B:					
Volney	>60	---	Low	Low	Low.
196C:					
Volney	>60	---	Low	Low	Low.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
206C:					
Shullsburg------	20-40	Soft	High--------	Moderate----	Low.
210E:					
Boone-----------	20-40	Soft	Low---------	Low---------	Moderate.
210F:					
Boone-----------	20-40	Soft	Low---------	Low---------	Moderate.
210G:					
Boone-----------	20-40	Soft	Low---------	Low---------	Moderate.
249C:					
Zwingle---------	>60	---	Moderate----	High--------	Moderate.
291:					
Atterberry------	>60	---	High--------	High--------	Moderate.
320:					
Arenzville------	>60	---	High--------	Moderate----	Moderate.
478G:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
Rock outcrop.					
484:					
Lawson----------	>60	---	High--------	Moderate----	Low.
485:					
Spillville------	>60	---	Moderate----	High--------	Moderate.
487B:					
Otter-----------	>60	---	High--------	High--------	Low.
Worthen---------	>60	---	High--------	Low---------	Low.
490:					
Caneek----------	>60	---	High--------	High--------	Low.
499C:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
499D:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
499D2:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
499E:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
499E2:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
499F:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
499G:					
Nordness--------	8-20	Hard	Low---------	Low---------	Low.
589:					
Otter-----------	>60	---	High--------	High--------	Low.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
703C:					
Dubuque----------	20-40	Hard	High--------	Moderate----	Moderate.
703C2:					
Dubuque----------	20-40	Hard	High--------	Moderate----	Moderate.
703D:					
Dubuque----------	20-40	Hard	High--------	Moderate----	Moderate.
703D2:					
Dubuque----------	20-40	Hard	High--------	Moderate----	Moderate.
703E:					
Dubuque----------	20-40	Hard	High--------	Moderate----	Moderate.
703E2:					
Dubuque----------	20-40	Hard	High--------	Moderate----	Moderate.
703F:					
Dubuque----------	20-40	Hard	High--------	Moderate----	Moderate.
721C:					
Massbach---------	40-60	Soft	High--------	High--------	Moderate.
721D:					
Massbach---------	40-60	Soft	High--------	High--------	Moderate.
740C:					
Hawick-----------	>60	---	Low---------	Low---------	Low.
740G:					
Hawick-----------	>60	---	Low---------	Low---------	Low.
778B:					
Sattre-----------	>60	---	Low---------	Low---------	High.
793B:					
Bertrand---------	>60	---	High--------	Low---------	Moderate.
793C:					
Bertrand---------	>60	---	High--------	Low---------	Moderate.
793D2:					
Bertrand---------	>60	---	High--------	Low---------	Moderate.
793E:					
Bertrand---------	>60	---	High--------	Low---------	Moderate.
826:					
Rowley-----------	>60	---	High--------	High--------	Moderate.
837C:					
Village----------	>60	---	High--------	Moderate----	High.
837C2:					
Village----------	>60	---	High--------	Moderate----	High.
837D:					
Village----------	>60	---	High--------	Moderate----	High.
837D2:					
Village----------	>60	---	High--------	Moderate----	High.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
837E:					
Village----------	>60	---	High--------	Moderate----	High.
837E2:					
Village----------	>60	---	High--------	Moderate----	High.
837F:					
Village----------	>60	---	High--------	Moderate----	High.
838C2:					
Allamakee--------	>60	---	High--------	Moderate----	High.
838D:					
Allamakee--------	>60	---	High--------	Moderate----	High.
838D2:					
Allamakee--------	>60	---	High--------	Moderate----	High.
838E2:					
Allamakee--------	>60	---	High--------	Moderate----	High.
840E:					
Lacrescent-------	>60	---	Moderate----	Low---------	Low.
840F:					
Lacrescent-------	>60	---	Moderate----	Low---------	Low.
840G:					
Lacrescent-------	>60	---	Moderate----	Low---------	Low.
841G:					
Rock outcrop.					
Boone------------	20-40	Soft	Low---------	Low---------	Moderate.
843:					
Elon-------------	>60	---	High--------	High--------	Low.
861D:					
Yellowriver------	>60	---	High--------	Moderate----	Moderate.
861D2:					
Yellowriver------	>60	---	High--------	Moderate----	Moderate.
861E:					
Yellowriver------	>60	---	High--------	Moderate----	Moderate.
861E2:					
Yellowriver------	>60	---	High--------	Moderate----	Moderate.
861F:					
Yellowriver------	>60	---	High--------	Moderate----	Moderate.
861G:					
Yellowriver------	>60	---	High--------	Moderate----	Moderate.
862D:					
Churchtown-------	>60	---	High--------	Moderate----	Moderate.
862D2:					
Churchtown-------	>60	---	High--------	Moderate----	Moderate.
862E:					
Churchtown-------	>60	---	High--------	Moderate----	Moderate.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
862E2:					
Churchtown------	>60	---	High--------	Moderate----	Moderate.
862F:					
Churchtown------	>60	---	High--------	Moderate----	Moderate.
903C2:					
Frankville------	20-40	Hard	High--------	Moderate----	Moderate.
903D:					
Frankville------	20-40	Hard	High--------	Moderate----	Moderate.
903D2:					
Frankville------	20-40	Hard	High--------	Moderate----	Moderate.
903E2:					
Frankville------	20-40	Hard	High--------	Moderate----	Moderate.
912C:					
Paintcreek------	>60	---	High--------	Moderate----	High.
912D:					
Paintcreek------	>60	---	High--------	Moderate----	High.
912D2:					
Paintcreek------	>60	---	High--------	Moderate----	High.
912E:					
Paintcreek------	>60	---	High--------	Moderate----	High.
912E2:					
Paintcreek------	>60	---	High--------	Moderate----	High.
912F:					
Paintcreek------	>60	---	High--------	Moderate----	High.
930:					
Orion-----------	>60	---	High--------	High--------	Low.
951G:					
Medary----------	>60	---	Moderate----	High--------	High.
977:					
Richwood--------	>60	---	High--------	Low---------	Low.
977B:					
Richwood--------	>60	---	High--------	Low---------	Low.
978B:					
Festina---------	>60	---	High--------	Moderate----	Moderate.
978C:					
Festina---------	>60	---	High--------	Moderate----	Moderate.
981B:					
Worthen---------	>60	---	High--------	Low---------	Low.
1120D:					
Lycurgus--------	>60	---	High--------	Moderate----	Moderate.
1120E:					
Lycurgus--------	>60	---	High--------	Moderate----	Moderate.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
1120F:					
Lycurgus	>60	---	High	Moderate	Moderate.
1490:					
Caneek	>60	---	High	High	Low.
1496:					
Arenzville	>60	---	High	Moderate	Moderate.
Volney	>60	---	Low	Low	Low.
1496B:					
Arenzville	>60	---	High	Moderate	Moderate.
Volney	>60	---	Low	Low	Low.
1793G:					
Bertrand	>60	---	High	Low	Moderate.
Chelsea	>60	---	Low	Low	Low.
2670:					
Ion	>60	---	High	Moderate	Low.
5010, 5030. Pits					
5040. Orthents					

References

American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 1993. Standard classification of soils for engineering purposes. ASTM Standard D 2487.

Clements, John. 1988. Iowa facts.

Iowa Department of Economic Development. 1987. Statistical profile of Iowa.

Jenny, Hans. 1941. Factors of soil formation.

Ruhe, Robert V. 1956. Geomorphic surfaces and the nature of soils. Soil Science 82: 441-445.

Ruhe, Robert V. 1969. Quaternary landscapes in Iowa.

Ruhe, Robert V., and others. 1955. Radiocarbon dates in central Iowa. Journal of Geology 63: 83-92.

Scholtes, W.H., and others. 1958. Soil survey of Allamakee County, Iowa. U.S. Department of Agriculture and Iowa Agricultural Experiment Station.

Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Science Society of America Proceedings 23: 152-156.

Smith, Guy D., and others. 1950. Prairie soils of the Upper Mississippi Valley. Advanced Agronomy 2: 157-205.

United States Department of Agriculture. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture. 1975. Soil taxonomy: A basic system for making and interpreting soil surveys. Soil Conservation Service, U.S. Department of Agriculture Handbook 436.

United States Department of Agriculture. 1993. Soil survey manual. U.S. Department of Agriculture Handbook 18.

Walker, Patrick H. 1966. Postglacial environments in relation to landscape and soils on the Cary Drift, Iowa. Iowa Agriculture and Home Economics Experiment Station Bulletin 549, pages 838-875.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at

least 30 percent of the surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant

periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposits. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a

gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 6 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is

absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or

other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial

material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses. Common in Wisconsin and Minnesota.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Burning an area under conditions of weather and soil moisture and at the time of day that will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or

manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from back slope to summit. The surface is dominantly convex in profile and erosional in orgin.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and

other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly (but not always) occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop,

and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope profile, exhibiting a nearly level surface. A general term for the top, or highest, level of a landform, such as a hill, a mountain, or tableland. It generally refers to a high interfluve area of gentler slope that is flanked by steeper hillslopes, for example, mountain fronts or tableland escarpments.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive, arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and

bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

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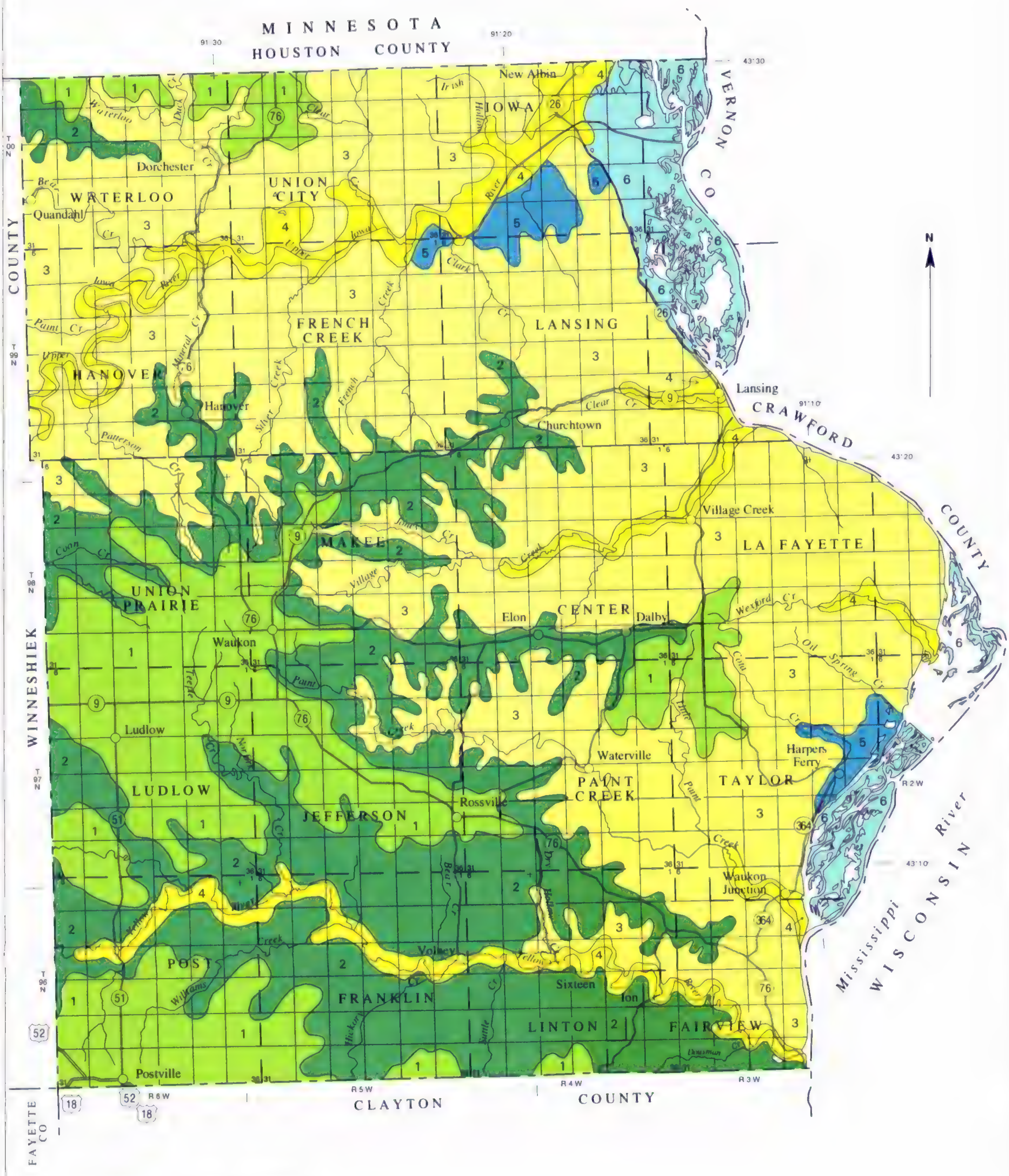


SOIL LEGEND*

1	Downs-Fayette association
2	Fayette-Nordness-Dubuque association
3	Lacrescent-Fayette-Village association
4	Ion-Eitzen-Bertrand association
5	Chelsea-Sparta association
6	Caneek association

*The units on this legend are described under the heading "General Soil Map Units."

Compiled 1997

TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts

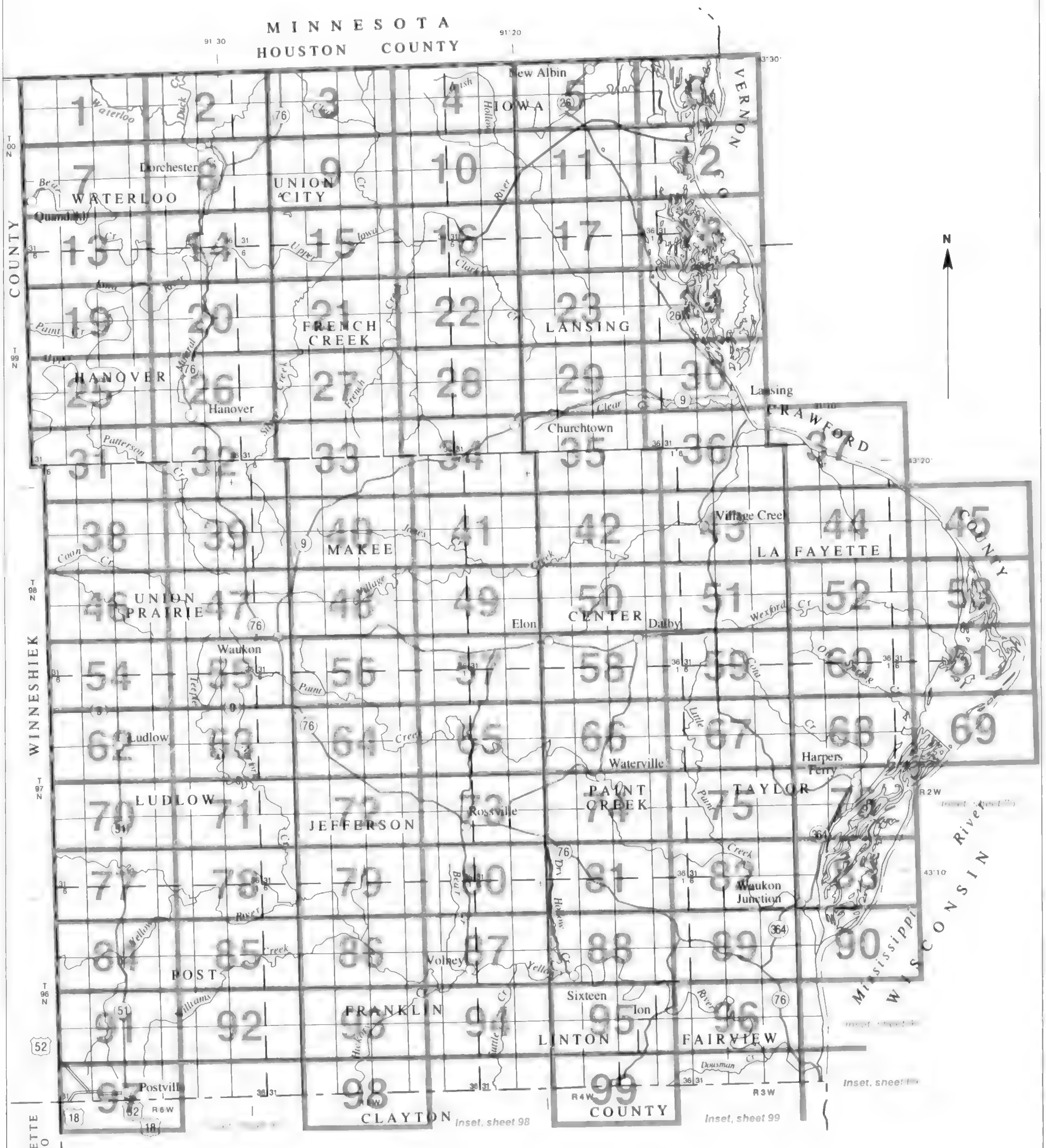
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
in cooperation with
IOWA AGRICULTURE AND HOME ECONOMICS
COOPERATIVE EXTENSION SERVICE,
IOWA STATE UNIVERSITY, and the
DIVISION OF SOIL CONSERVATION,
IOWA DEPARTMENT OF AGRICULTURE
and LAND STEWARDSHIP

GENERAL SOIL MAP
ALLAMAKEE COUNTY, IOWA

Scale 1:190080

1 0 1 2 3 MILES

1 0 1 2 3 4 5 6 KILOMETERS



TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

ALLAMAKEE COUNTY, IOWA

Scale 1:190080

1 0 1 2 3 MILES

1 0 1 2 3 4 5 6 KILOMETERS

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded.

SYMBOL	NAME
40D	Fayette silt loam, karst, 2 to 14 percent slopes
41B	Sparta sand, 2 to 5 percent slopes
41C	Sparta sand, 5 to 9 percent slopes
41D	Sparta sand, 9 to 14 percent slopes
63B	Chelsea loamy sand, 2 to 5 percent slopes
63C	Chelsea loamy sand, 5 to 9 percent slopes
63D	Chelsea loamy sand, 9 to 14 percent slopes
63E	Chelsea loamy sand, 14 to 18 percent slopes
63F	Chelsea loamy sand, 18 to 25 percent slopes
63G	Chelsea loamy sand, 25 to 45 percent slopes
85	Eitzen silt loam, 0 to 2 percent slopes
85B	Eitzen silt loam, 2 to 5 percent slopes
98	Huntsville silt loam, 0 to 2 percent slopes
98B	Huntsville silt loam, 2 to 5 percent slopes
118	Garwin silty clay loam, 0 to 2 percent slopes
119B	Muscatine silt loam, 1 to 4 percent slopes
120B	Tama silt loam, 2 to 5 percent slopes
120C	Tama silt loam, 5 to 9 percent slopes
129B	Arenzville-Chaseburg complex, 1 to 5 percent slopes
140B	Sparta loamy sand, 2 to 5 percent slopes
140C	Sparta loamy sand, 5 to 9 percent slopes
142	Chaseburg silt loam, 0 to 2 percent slopes
162B	Downs silt loam, 2 to 5 percent slopes
162B2	Downs silt loam, 2 to 5 percent slopes, moderately eroded
162C	Downs silt loam, 5 to 9 percent slopes
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded
162D	Downs silt loam 9 to 14 percent slopes
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded
163B	Fayette silt loam, 2 to 5 percent slopes
163B2	Fayette silt loam, 2 to 5 percent slopes, moderately eroded
163C	Fayette silt loam, 5 to 9 percent slopes
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded
163D	Fayette silt loam, 9 to 14 percent slopes
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded
163E	Fayette silt loam, 14 to 18 percent slopes
163E2	Fayette silt loam, 14 to 18 percent slopes moderately eroded
163F	Fayette silt loam, 18 to 25 percent slopes
163G	Fayette silt loam 25 to 40 percent slopes
178B	Waukee loam, 1 to 5 percent slopes
196B	Volney channery loam, 2 to 5 percent slopes
196C	Volney channery loam, 5 to 9 percent slopes
206C	Shullsburg silty clay loam 3 to 9 percent slopes
210E	Boone loamy sand, 9 to 18 percent slopes
210F	Boone loamy sand, 18 to 25 percent slopes
210G	Boone loamy sand 25 to 40 percent slopes
249C	Zwingle silt loam, 1 to 9 percent slopes
291	Atterberry silt loam, 1 to 3 percent slopes
320	Arenzville silt loam, 0 to 2 percent slopes
478G	Nordness-Rock outcrop complex, 25 to 60 percent slopes
484	Lawson silt loam, 0 to 2 percent slopes
485	Spillville loam, 0 to 2 percent slopes
487B	Otter-Worthen complex, 1 to 4 percent slopes
490	Caneek silt loam, 0 to 2 percent slopes
499C	Nordness silt loam, 5 to 9 percent slopes
499D	Nordness silt loam, 9 to 14 percent slopes
499D2	Nordness silt loam, 9 to 14 percent slopes, moderately eroded
499E	Nordness silt loam, 14 to 18 percent slopes
499E2	Nordness silt loam, 14 to 18 percent slopes moderately eroded
499F	Nordness silt loam 18 to 25 percent slopes
499G	Nordness silt loam 25 to 40 percent slopes
589	Otter silt loam, 0 to 2 percent slopes
703C	Dubuque silt loam, 5 to 9 percent slopes
703C2	Dubuque silt loam, 5 to 9 percent slopes, moderately eroded
703D	Dubuque silt loam, 9 to 14 percent slopes
703D2	Dubuque silt loam, 9 to 14 percent slopes, moderately eroded
703E	Dubuque silt loam 14 to 18 percent slopes
703E2	Dubuque silt loam, 14 to 18 percent slopes, moderately eroded
703F	Dubuque silt loam, 18 to 25 percent slopes
721C	Massbach silt loam, 3 to 9 percent slopes
721D	Massbach silt loam, 9 to 15 percent slopes
740C	Hawick gravelly sand, 2 to 9 percent slopes
740G	Hawick gravelly sand, 18 to 40 percent slopes
778B	Sattre loam, 1 to 5 percent slopes
793B	Bertrand silt loam, 2 to 5 percent slopes
793C	Bertrand silt loam, 5 to 9 percent slopes
793D2	Bertrand silt loam, 9 to 14 percent slopes, moderately eroded
793E	Bertrand silt loam 14 to 18 percent slopes
826	Rowley silt loam 0 to 2 percent slopes
837C	Village silt loam, 5 to 9 percent slopes
837C2	Village silt loam, 5 to 9 percent slopes, moderately eroded
837D	Village silt loam, 9 to 14 percent slopes
837D2	Village silt loam, 9 to 14 percent slopes, moderately eroded
837E	Village silt loam, 14 to 18 percent slopes
837E2	Village silt loam, 14 to 18 percent slopes, moderately eroded
837F	Village silt loam, 18 to 25 percent slopes
838C2	Allamakee silt loam, 5 to 9 percent slopes, moderately eroded
838D	Allamakee silt loam, 9 to 14 percent slopes
838D2	Allamakee silt loam, 9 to 14 percent slopes, moderately eroded
838E2	Allamakee silt loam, 14 to 18 percent slopes, moderately eroded
840E	Lacrescent silt loam, 14 to 18 percent slopes
840F	Lacrescent silt loam, 18 to 25 percent slopes
840G	Lacrescent silt loam 25 to 70 percent slopes
841G	Rock outcrop-Boone complex, 20 to 70 percent slopes
843	Elon silt loam, 0 to 2 percent slopes
861D	Yellowriver silt loam, 9 to 14 percent slopes
861D2	Yellowriver silt loam, 9 to 14 percent slopes, moderately eroded
861E	Yellowriver silt loam, 14 to 18 percent slopes
861E2	Yellowriver silt loam, 14 to 18 percent slopes, moderately eroded
861F	Yellowriver silt loam, 18 to 25 percent slopes
861G	Yellowriver silt loam, 25 to 40 percent slopes
862D	Churchtown loam, 9 to 14 percent slopes
862D2	Churchtown loam 9 to 14 percent slopes, moderately eroded
862E	Churchtown loam, 14 to 18 percent slopes
862E2	Churchtown loam, 14 to 18 percent slopes, moderately eroded
862F	Churchtown loam, 18 to 25 percent slopes
903C2	Frankville silt loam, 5 to 9 percent slopes, moderately eroded
903D	Frankville silt loam, 9 to 14 percent slopes
903D2	Frankville silt loam, 9 to 14 percent slopes, moderately eroded
903E2	Frankville silt loam, 14 to 18 percent slopes, moderately eroded
912C	Paintcreek silt loam, 5 to 9 percent slopes
912D	Paintcreek silt loam, 9 to 14 percent slopes
912D2	Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded
912E	Paintcreek silt loam 14 to 18 percent slopes
912E2	Paintcreek silt loam, 14 to 18 percent slopes, moderately eroded
912F	Paintcreek silt loam, 18 to 30 percent slopes
930	Orion silt loam, 0 to 2 percent slopes
951G	Medary silt loam, 14 to 45 percent slopes
977	Richwood silt loam, 0 to 2 percent slopes
977B	Richwood silt loam, 2 to 5 percent slopes
978B	Festina silt loam, 2 to 5 percent slopes
978C	Festina silt loam 5 to 9 percent slopes
981B	Worthen silt loam, 2 to 7 percent slopes
1120D	Lycurgus silt loam 9 to 14 percent slopes
1120E	Lycurgus silt loam, 14 to 18 percent slopes
1120F	Lycurgus silt loam, 18 to 25 percent slopes
1490	Caneek silt loam channeled 0 to 2 percent slopes
1496	Arenzville-Volney complex 0 to 2 percent slopes
1496B	Arenzville Volney complex 2 to 5 percent slopes
1793G	Bertrand-Chelsea complex 18 to 35 percent slopes
2670	Ion silt loam, 0 to 2 percent slopes
5010	Pits sand and gravel
5030	Pits limestone quarries
5040	Orthents loamy

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, or cemetery

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads

ROAD EMBLEM & DESIGNATIONS

- Federal 287
- State 52

RAILROAD

LEVEES

- Without road

DAMS

- Large (to scale)
- Medium or Small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Crossable with tillage implements
- Not crossable with tillage implements
- Drainage end
- Canals or ditches
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Wet spot
- Sewage lagoon S L

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS 163C 703D

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

MISCELLANEOUS

- Gravelly spot
- Rock outcrop (includes sandstone and shale)
- Sandy spot
- Severely eroded spot
- Stony spot, very stony spot
- Calcareous spot
- Sinkhole not crossable with tillage implements
- Limestone at a depth of 20 to 40 inches
- Glacial till spot
- Shale bedrock 20 to 30 inches in depth

N

1 MILE

1 KILOMETER

0 1/4 1/2 3/4

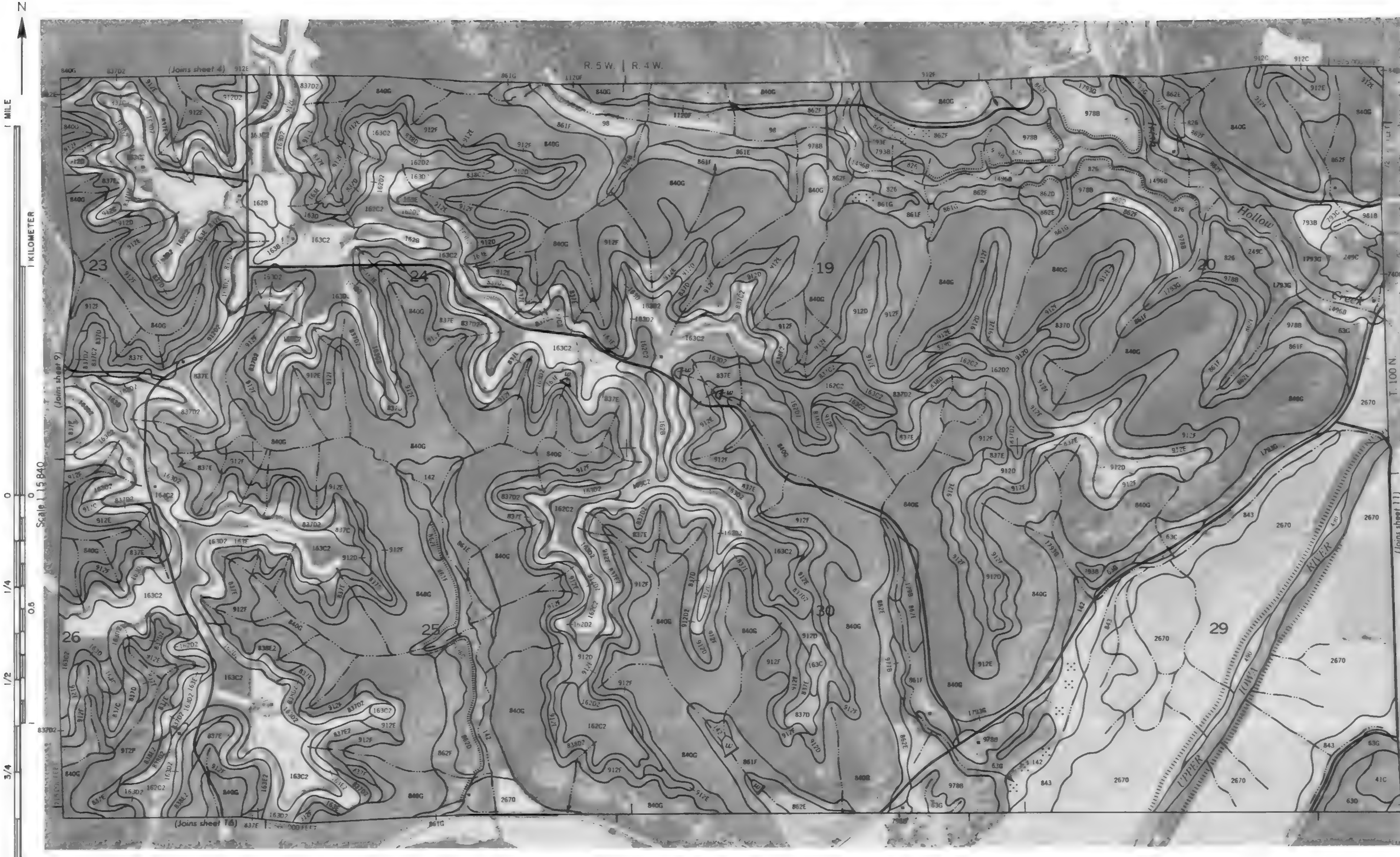
0 0.5 1

Scale 1:15 840

ALLAMAKEE COUNTY, IOWA NO. 1

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 10



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ALLAMAKEE COUNTY, IOWA NO. 10

ALLAMAKEE COUNTY, IOWA NO. 11

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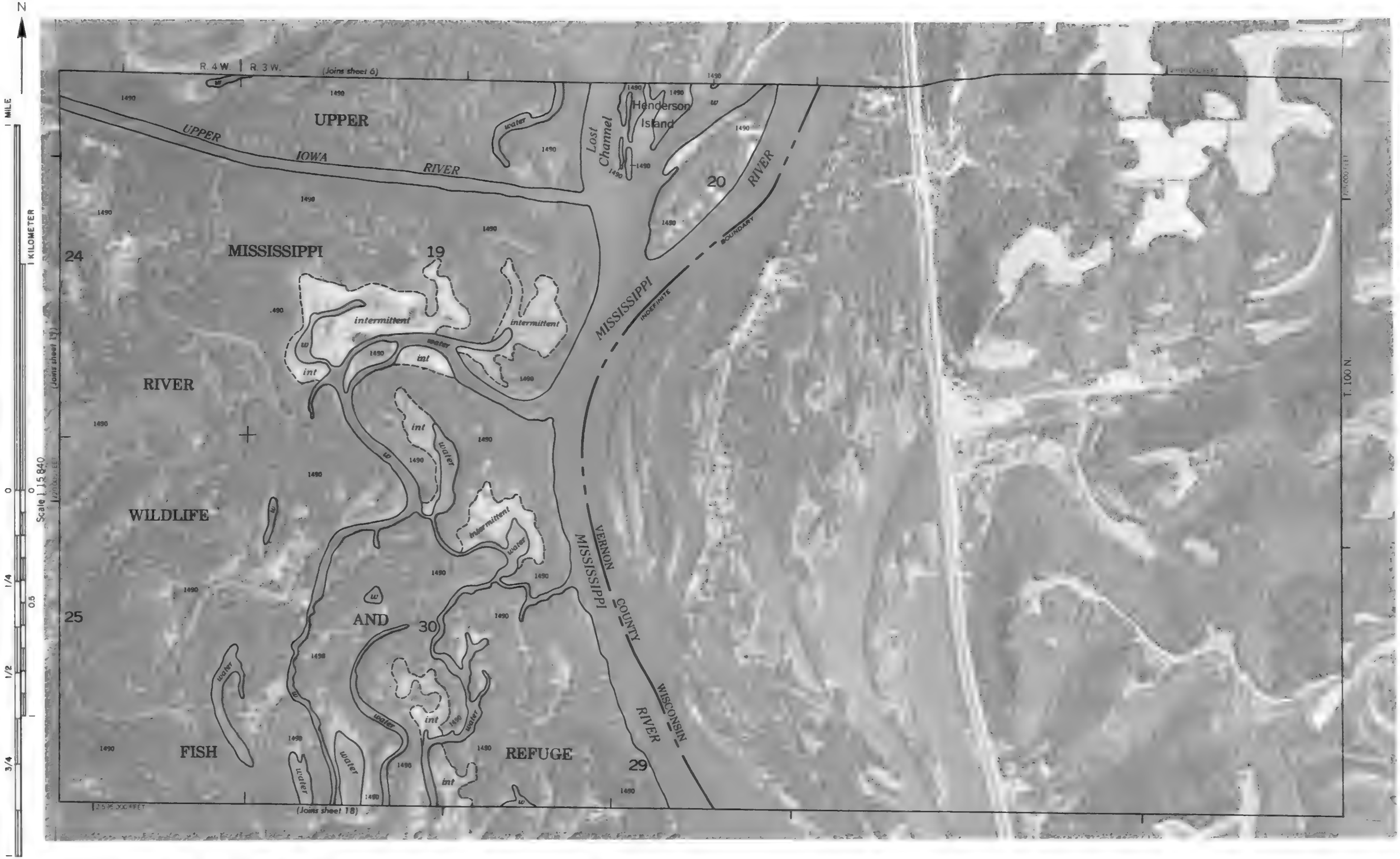

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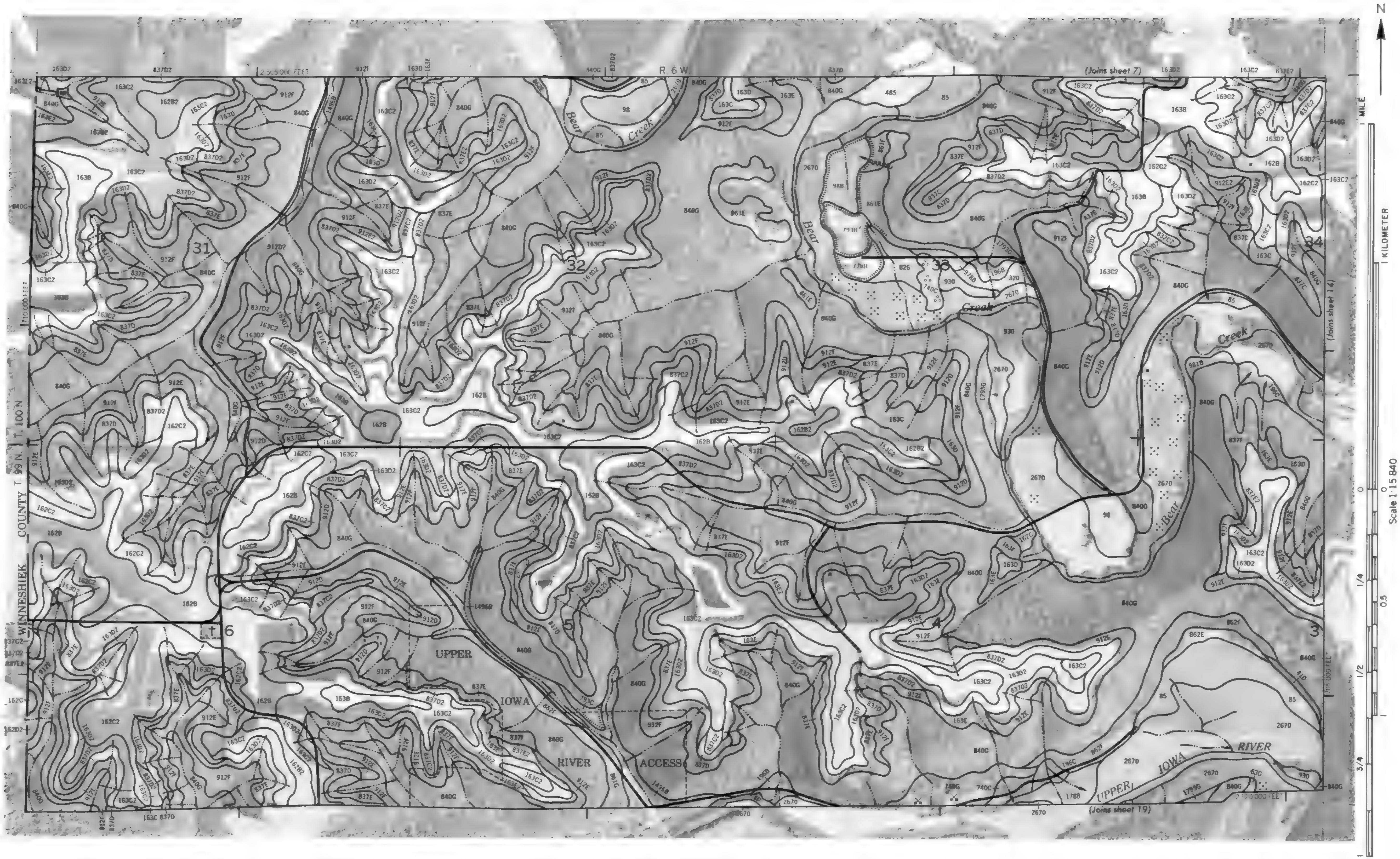

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ALLAMAKEE COUNTY, IOWA NO. 14

ALLAMAKEE COUNTY, IOWA NO. 15

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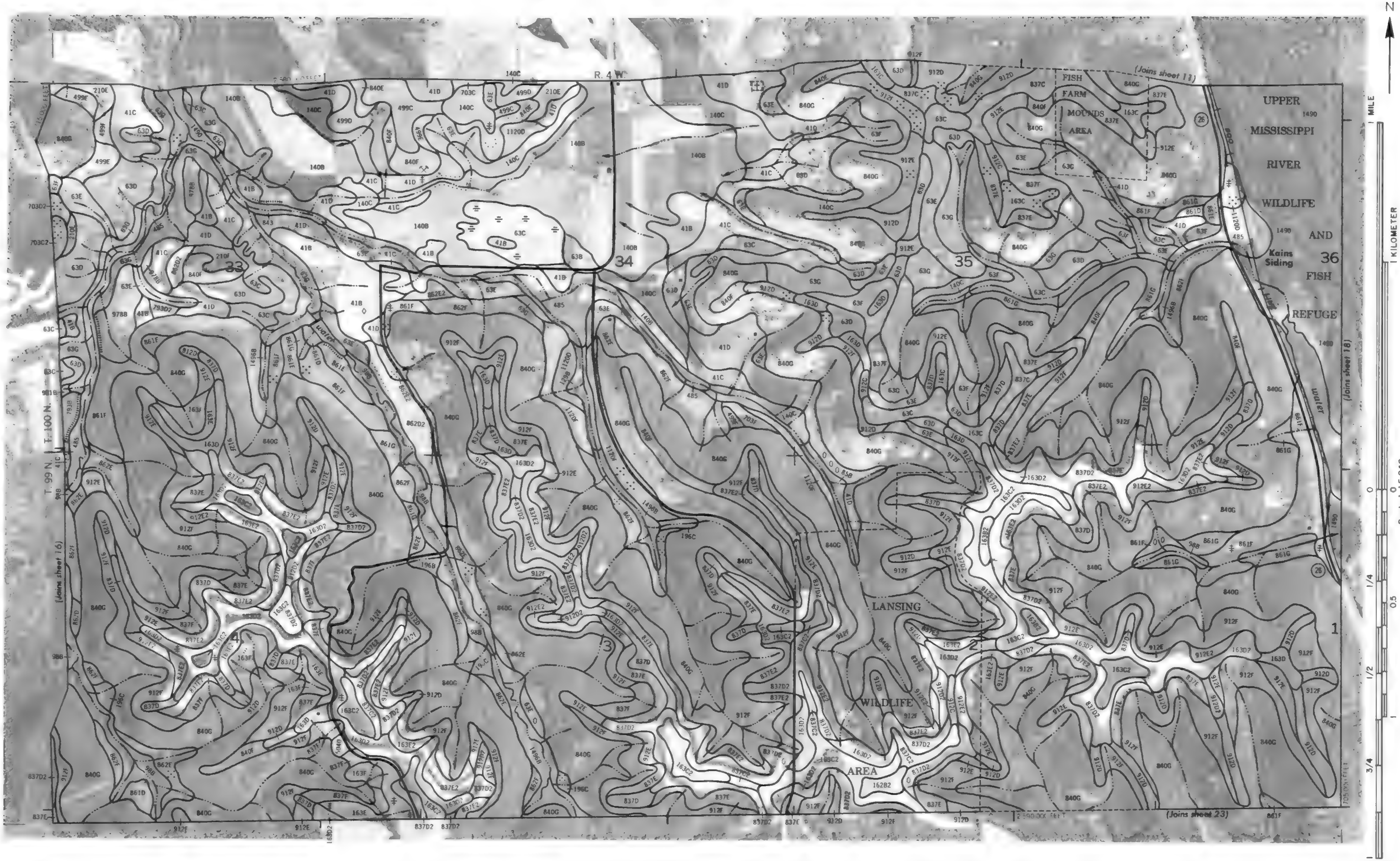
ALLAMAKEE COUNTY, IOWA NO. 16



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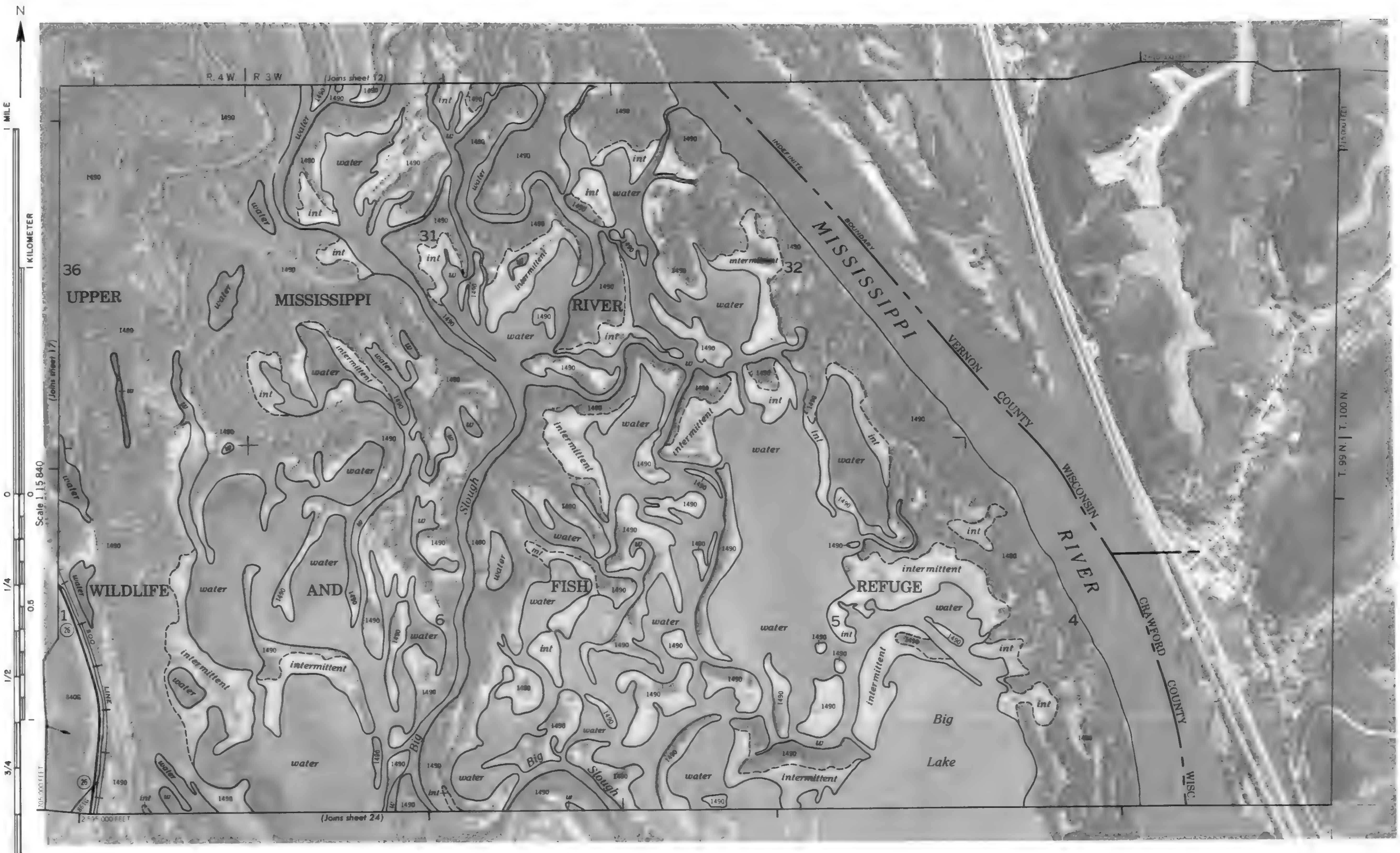
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 18



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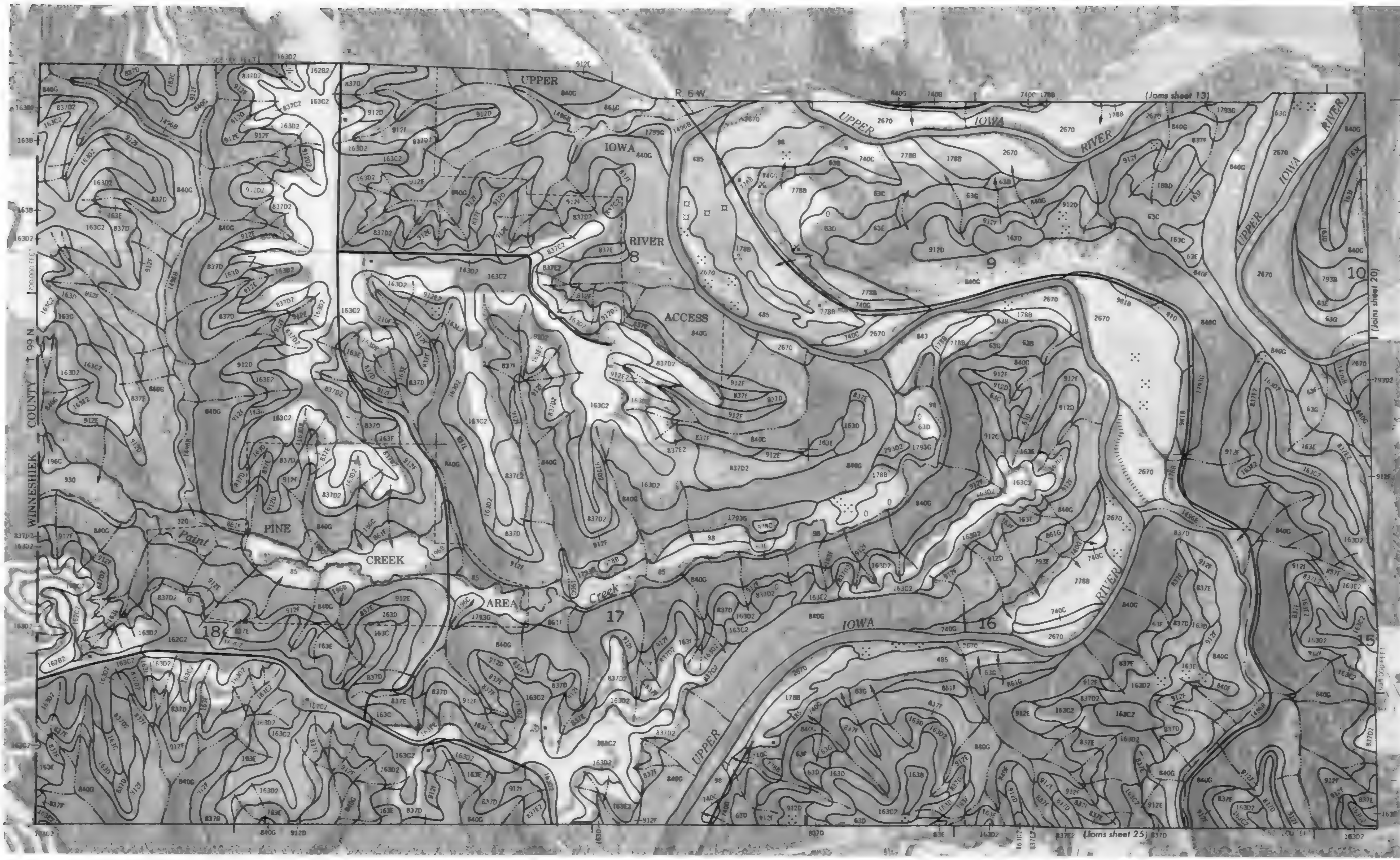

N

1 MILE

1 KILOMETER

Scale 1:15 840

ALLAMAKEE COUNTY, IOWA NO. 19

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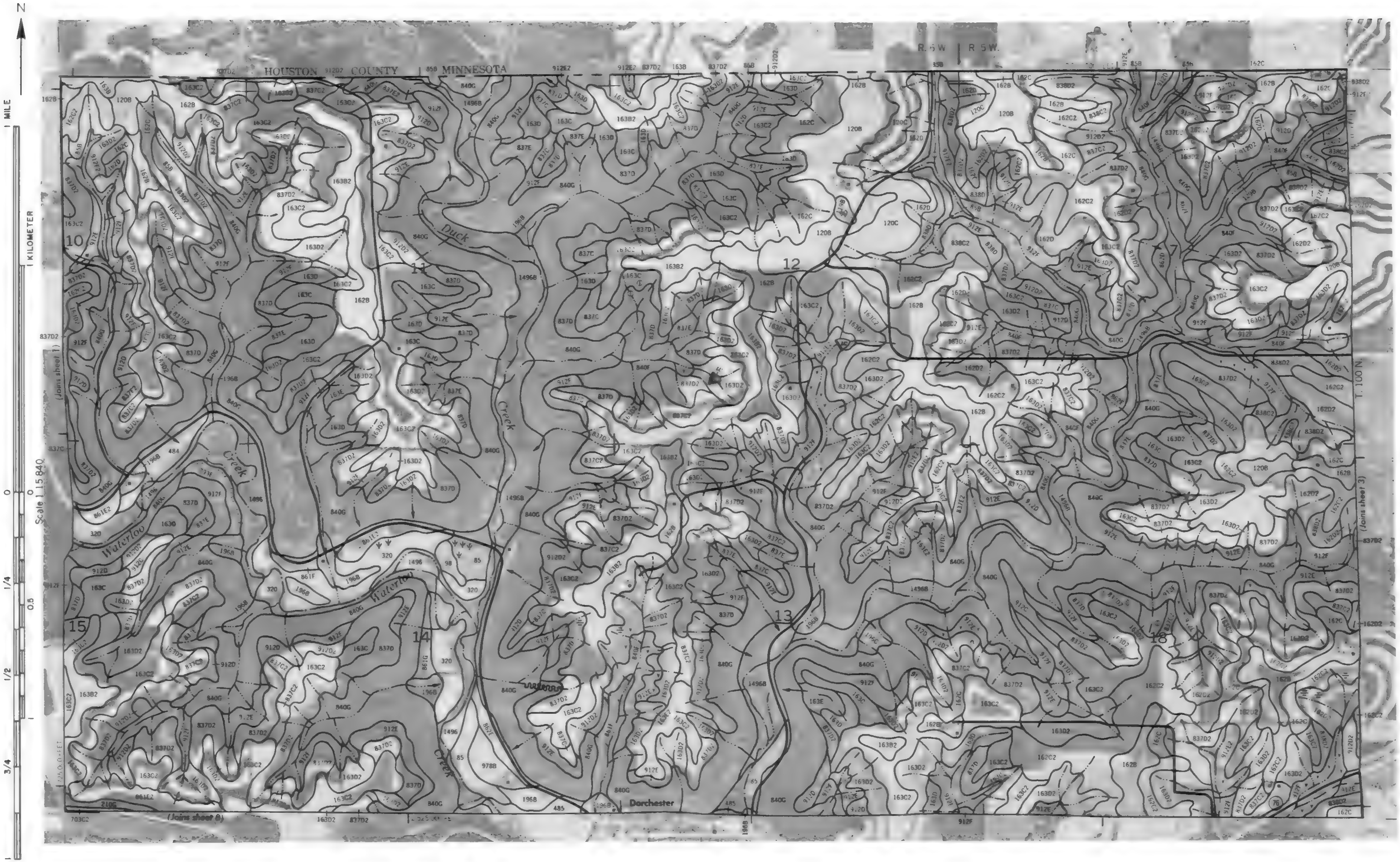
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 2



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ALLAMAKEE COUNTY, IOWA NO. 2

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 20

N

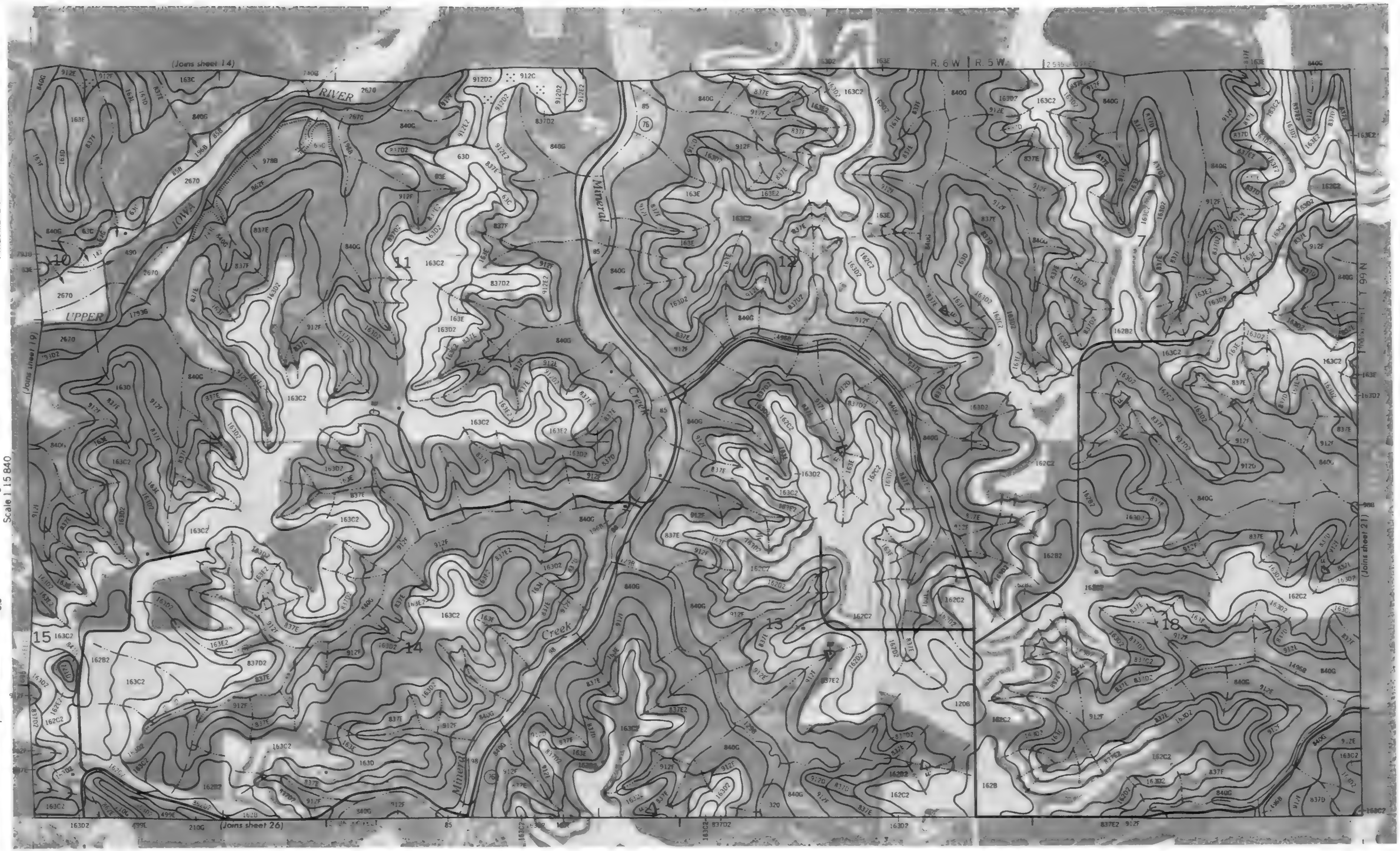
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0 0.5



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ALLAMAKEE COUNTY, IOWA NO. 21

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SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 22

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0 0.5

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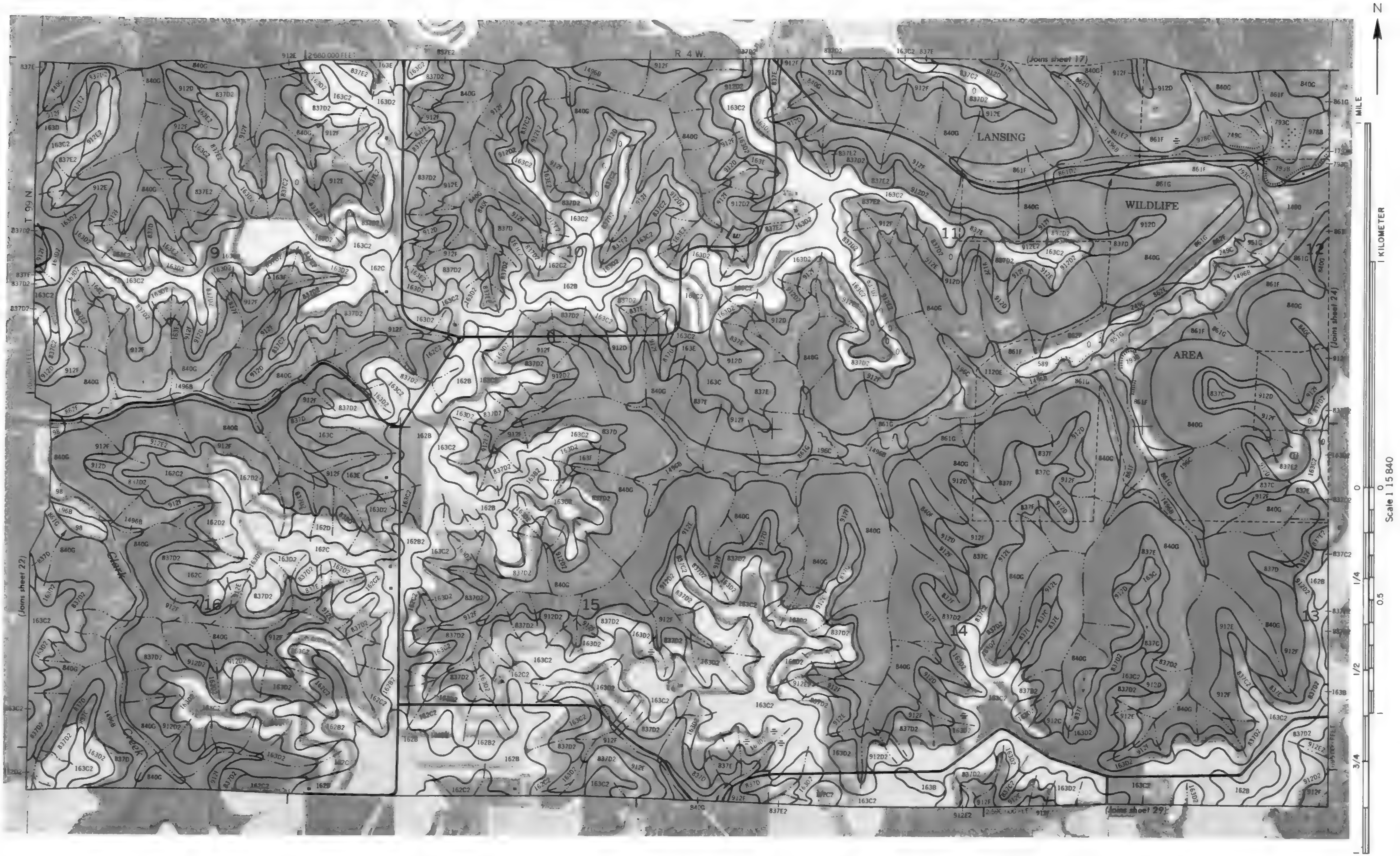

ALLAMAKEE COUNTY, IOWA NO. 23

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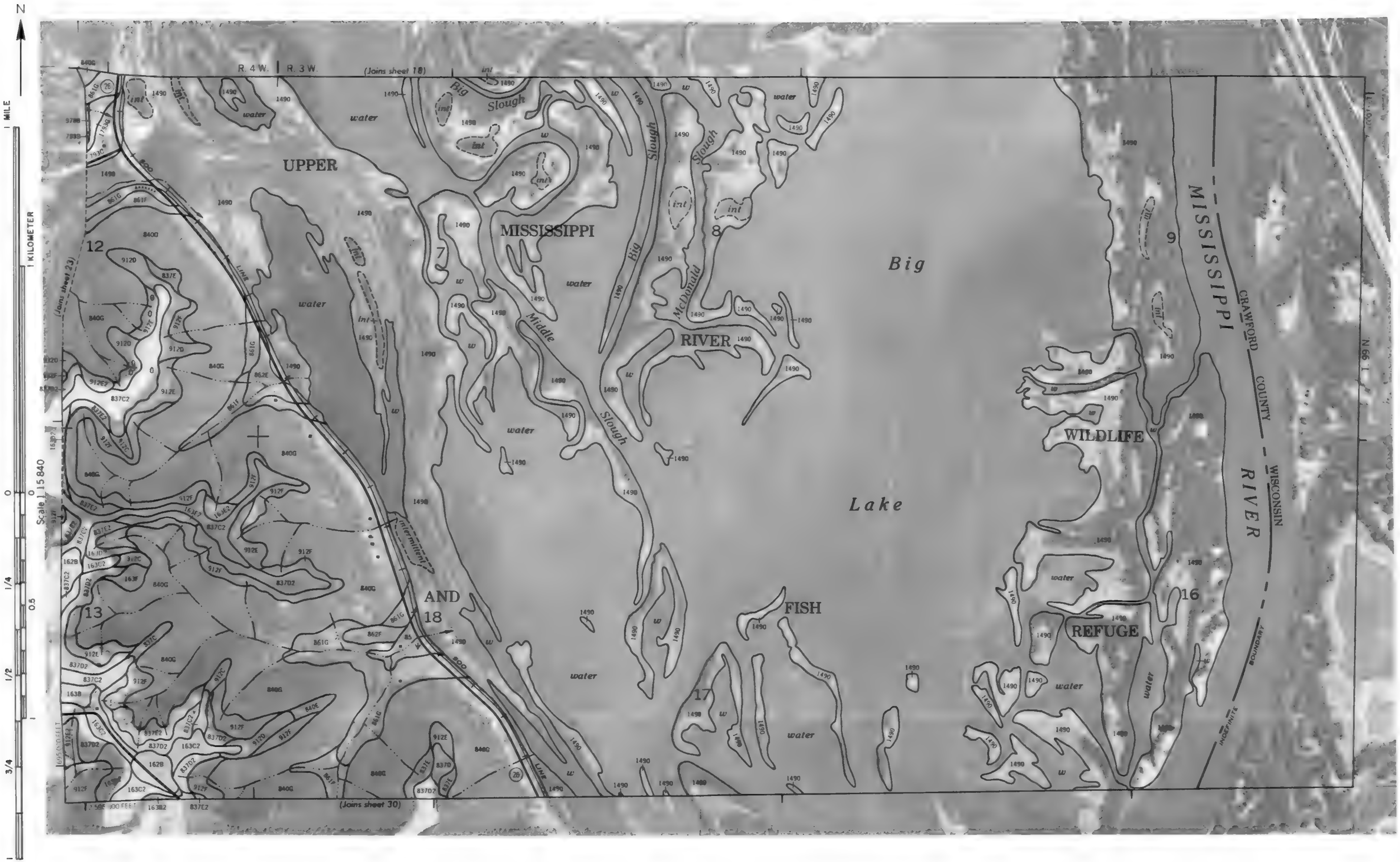
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 24



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ALLAMAKEE COUNTY, IOWA NO. 24

ALLAMAKEE COUNTY, IOWA NO. 25

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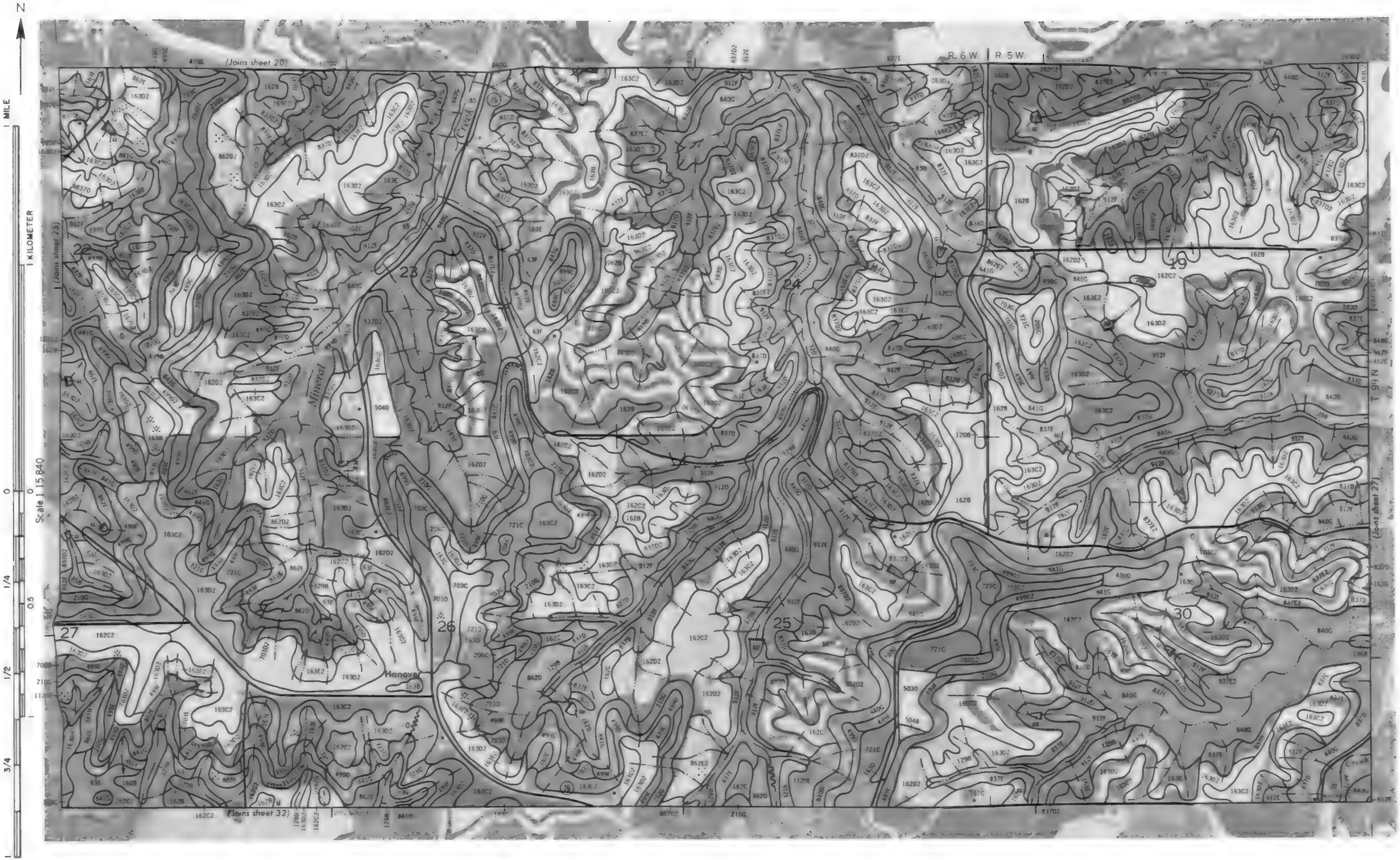
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 26



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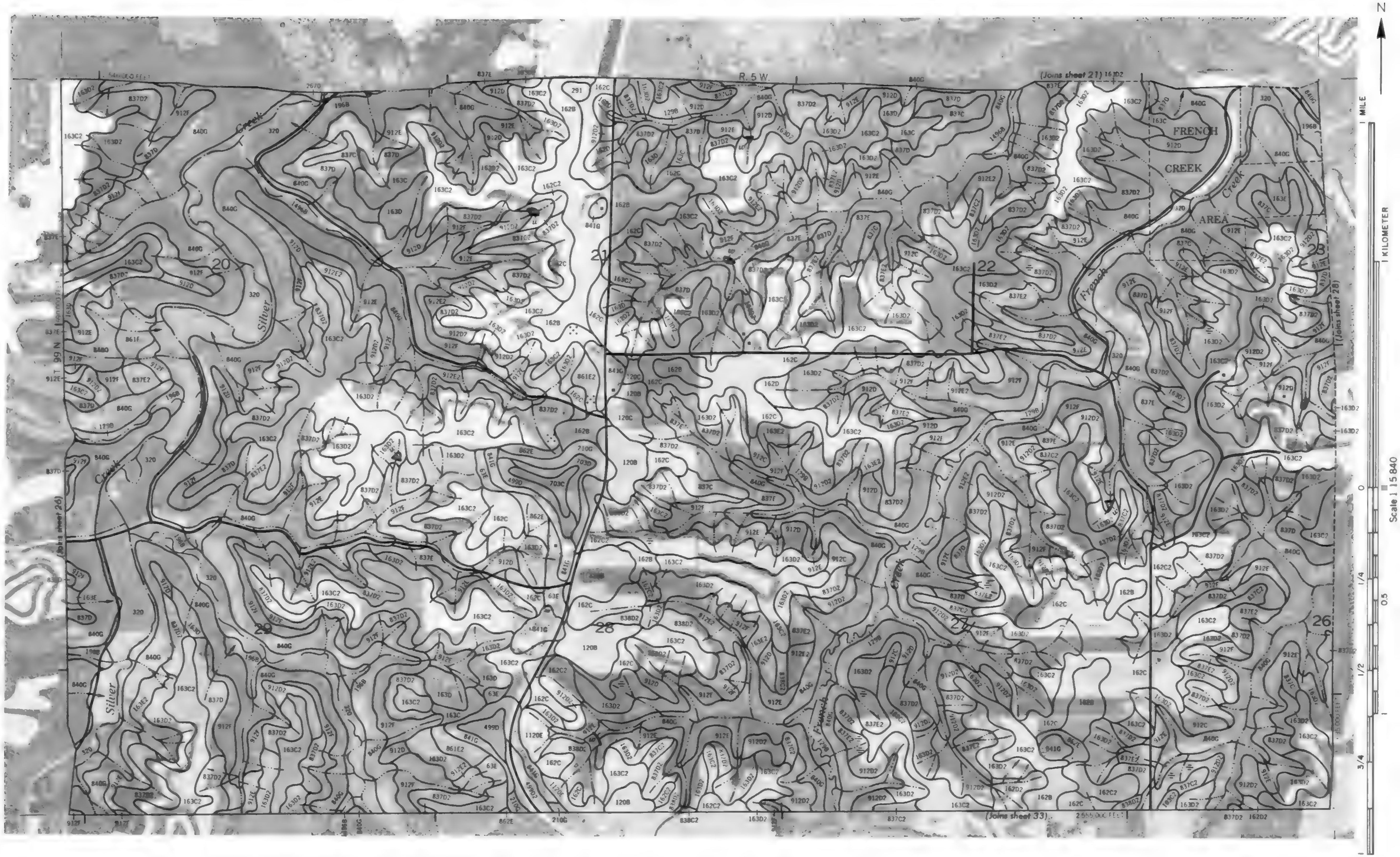

ALLAMAKEE COUNTY, IOWA NO. 27

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SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 28

N

1 MILE

1 KILOMETER

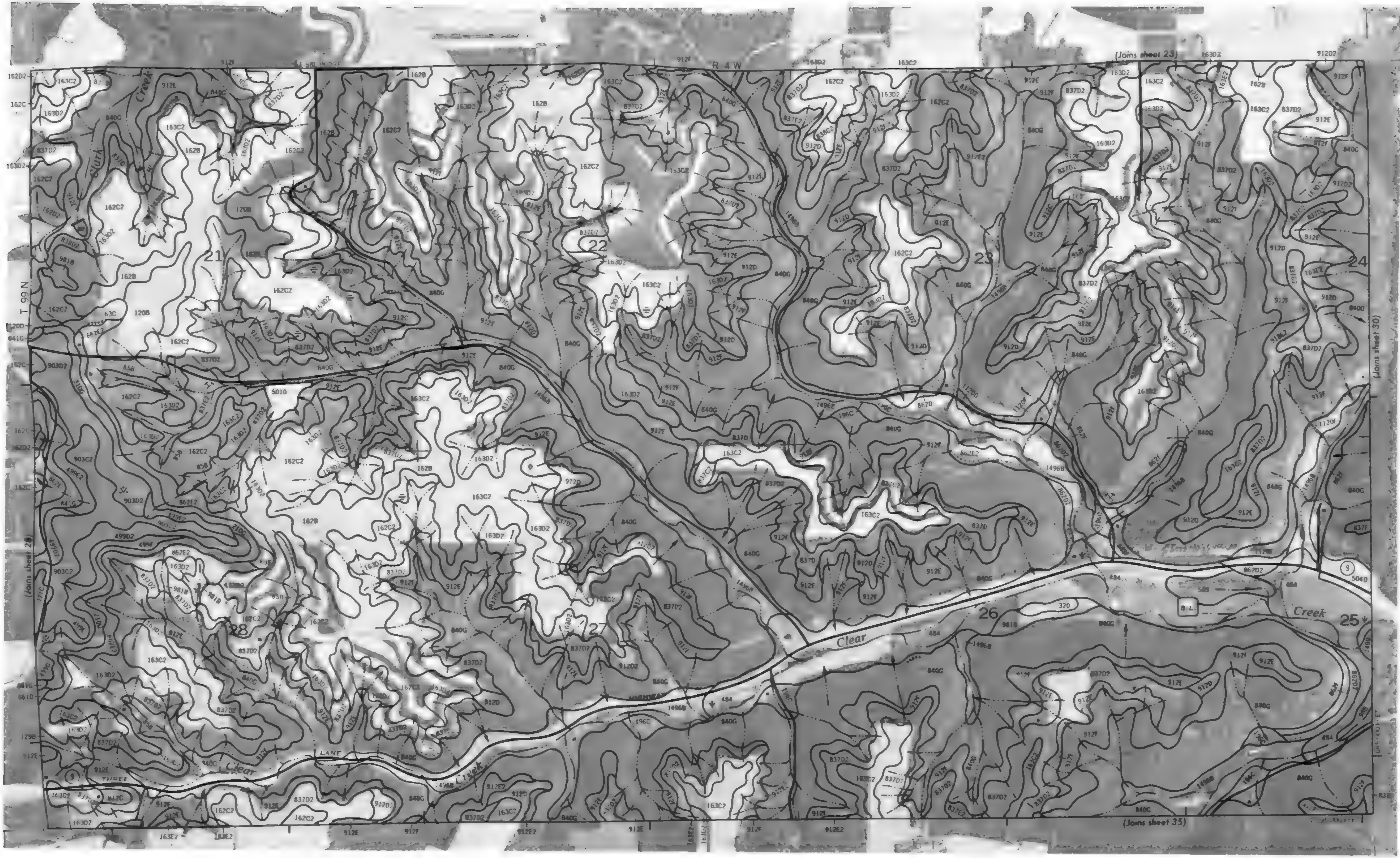
0 0 1/4 0.5 1/2 3/4 1

Scale 1:15 840

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 28

N



1 MILE

1 KILOMETER

Scale 1:15 840

ALLAMAKEE COUNTY, IOWA NO. 29

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 3

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

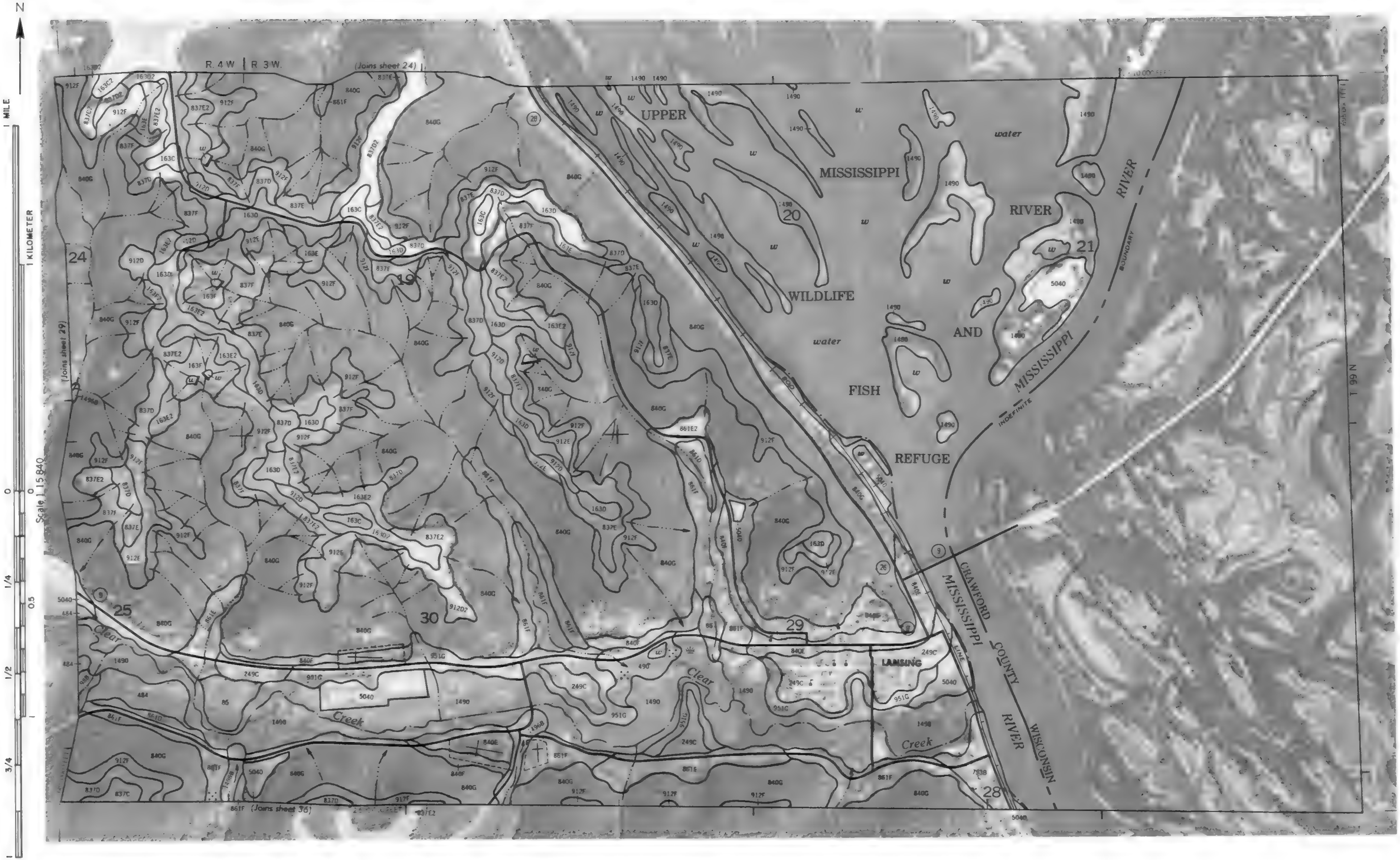
N

MILE

1 KILOMETER

Scale 1:15 840

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 30



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

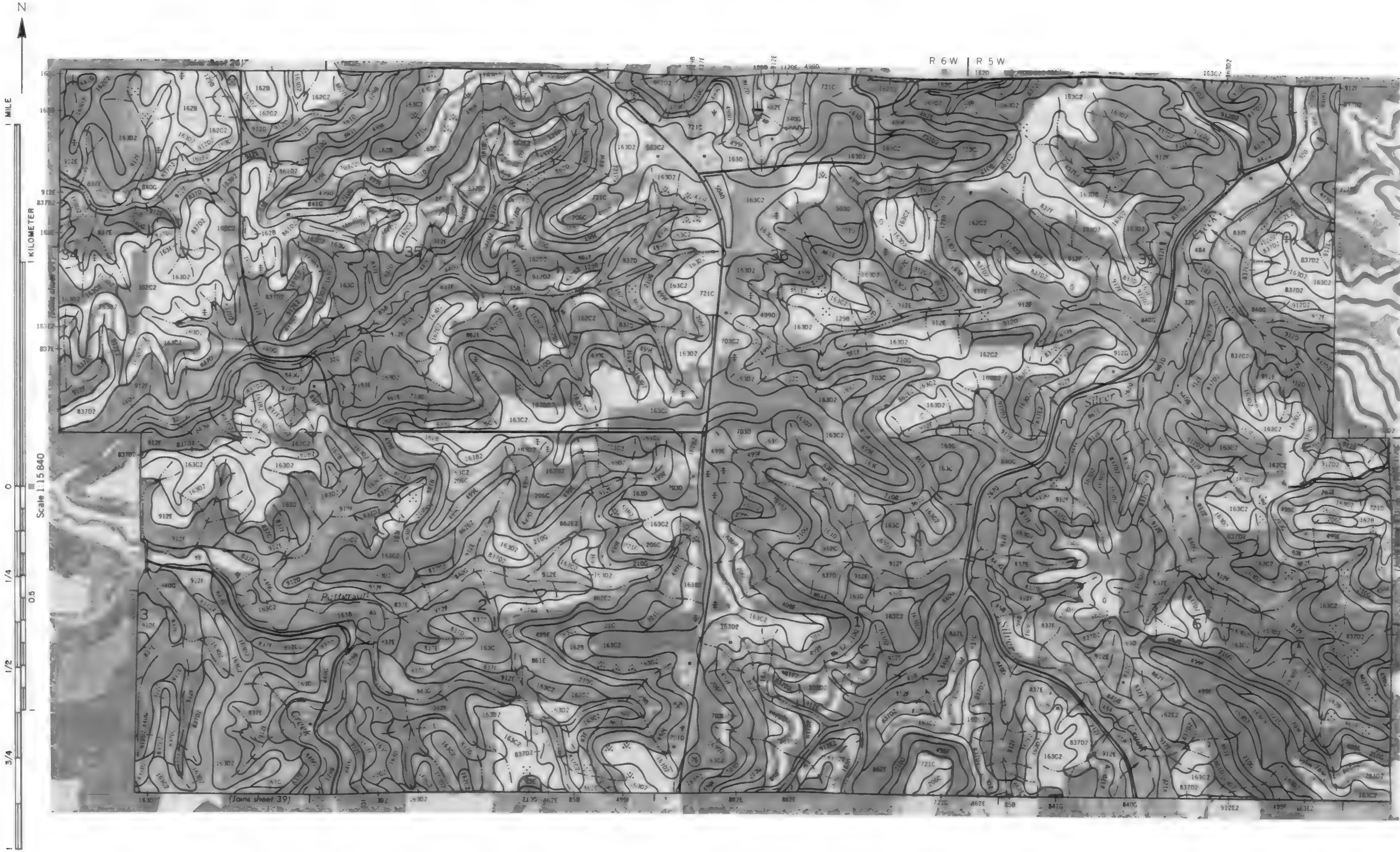
ALLAMAKEE COUNTY, IOWA NO. 30

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 31

ALLAMAKEE COUNTY, IOWA NO. 31

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 32



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

ALLAMAKEE COUNTY, IOWA NO. 32

33

N

ALLAMAKEE COUNTY, IOWA NO. 33

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0 0.5

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 34

N

1 MILE

1 KILOMETER

Scale 1:15 840

0

1/4

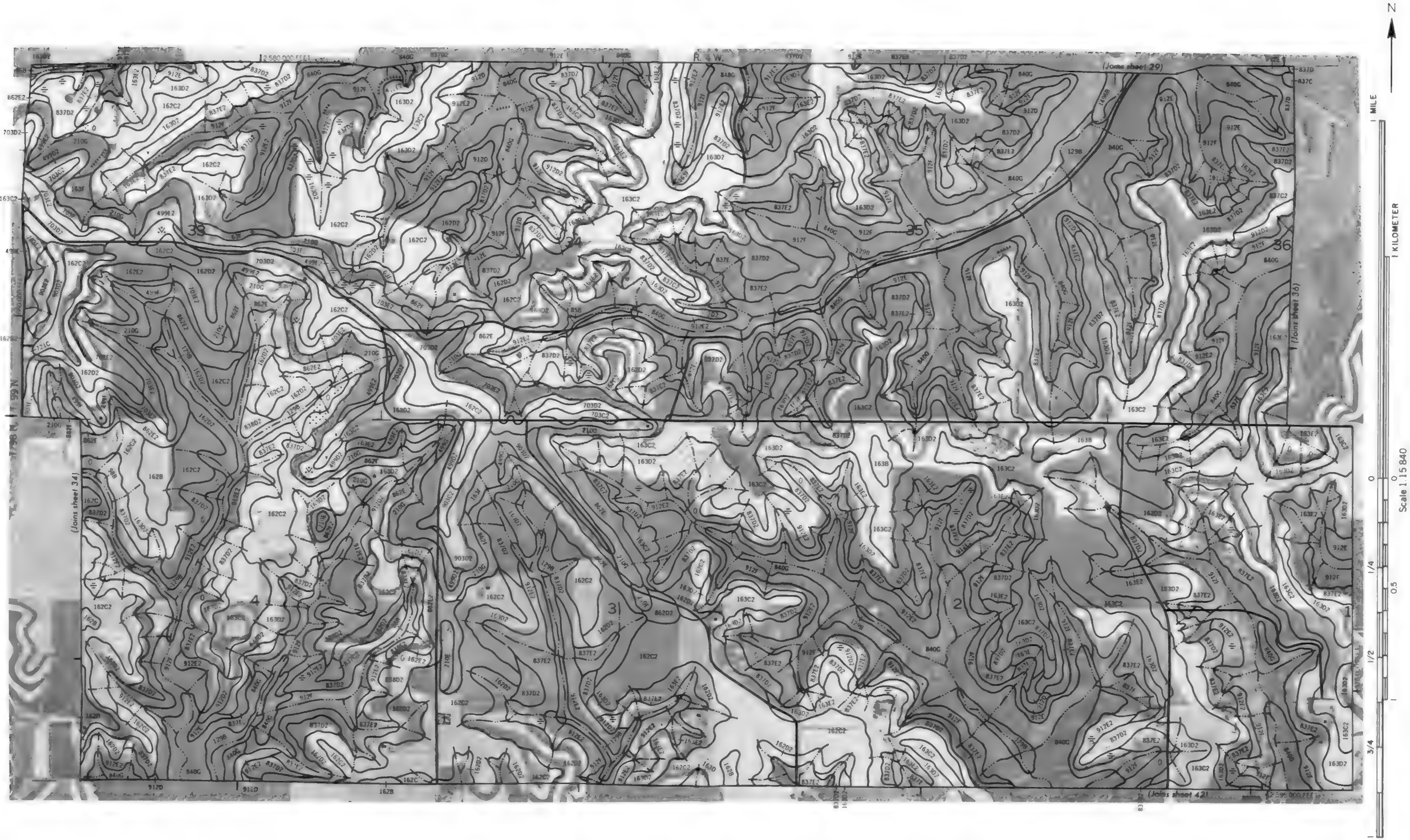
0.5

1/2

3/4

1

ALLAMAKEE COUNTY, IOWA NO 34



ALLAMAKEE COUNTY, IOWA NO. 35

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

36

N

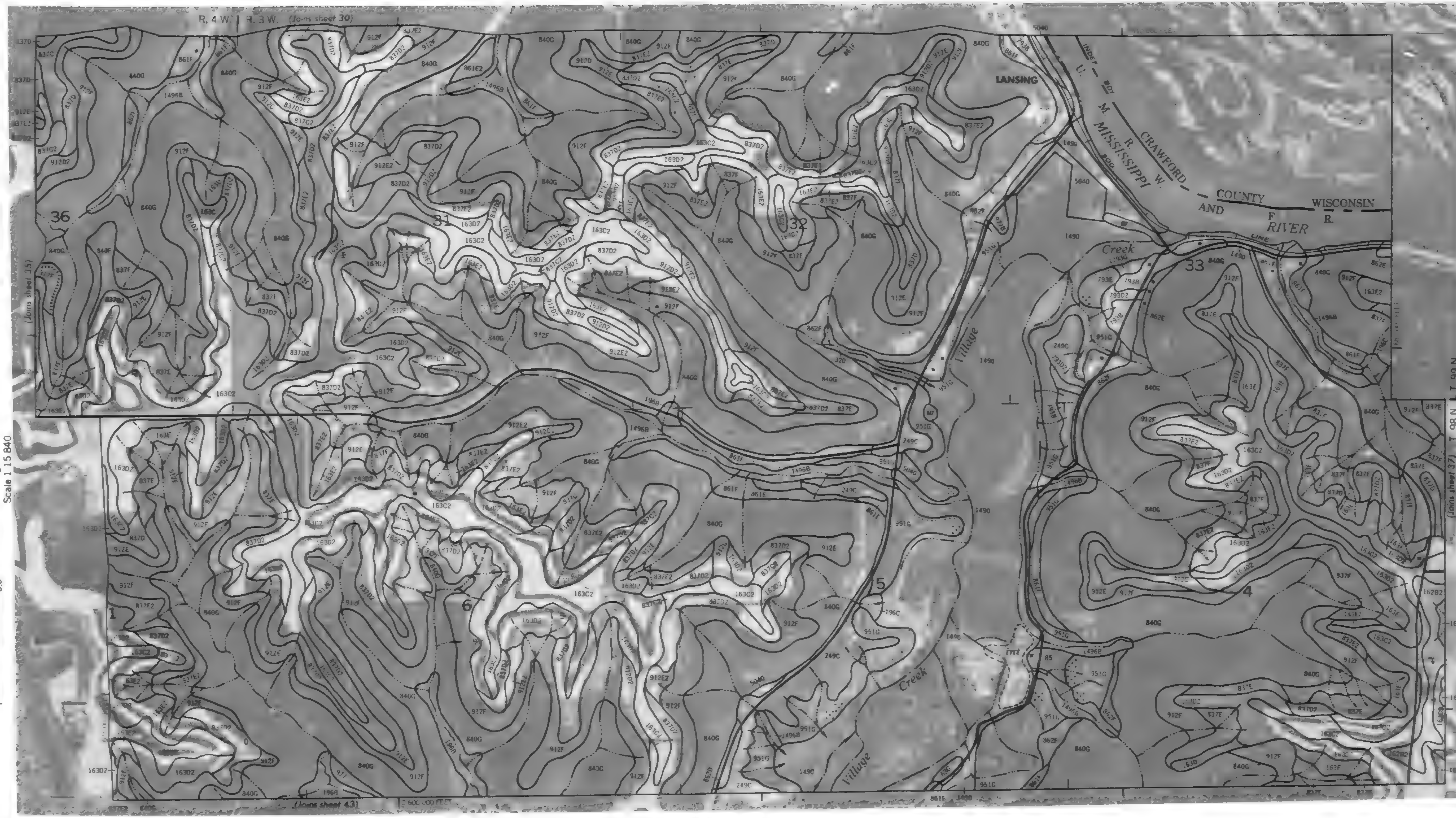
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

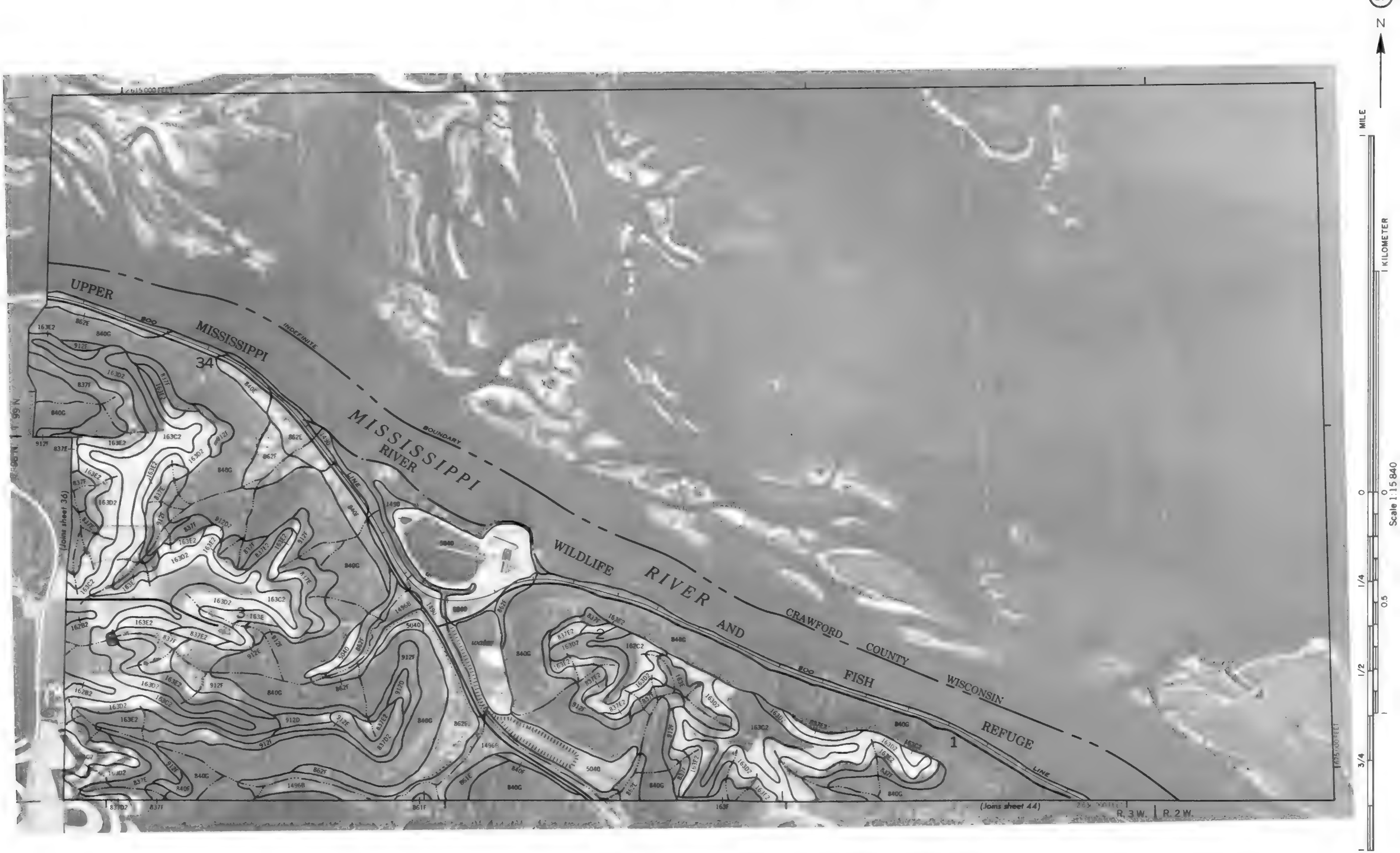
0 0.5 1



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 36

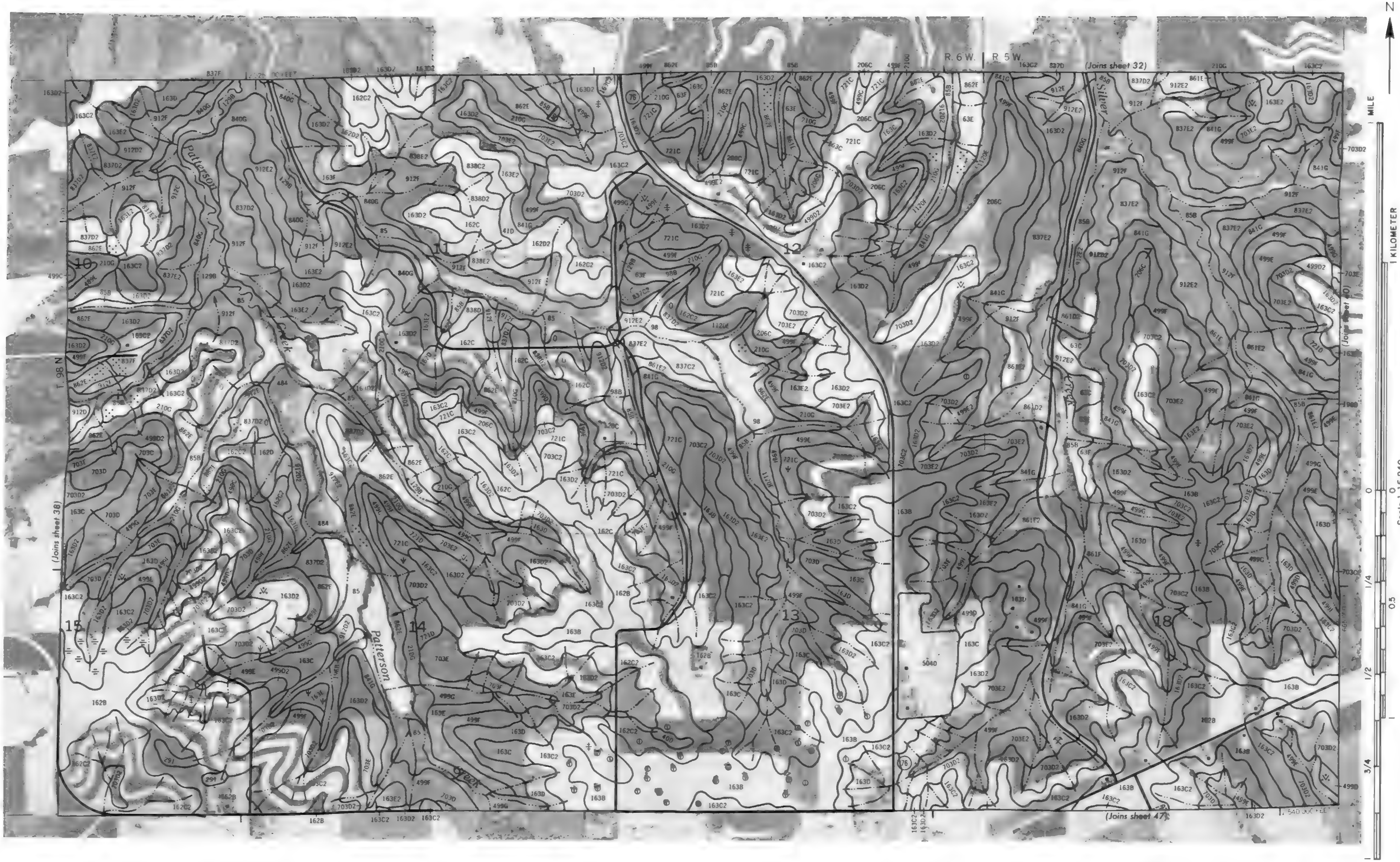
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 39

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 4

N

1 MILE

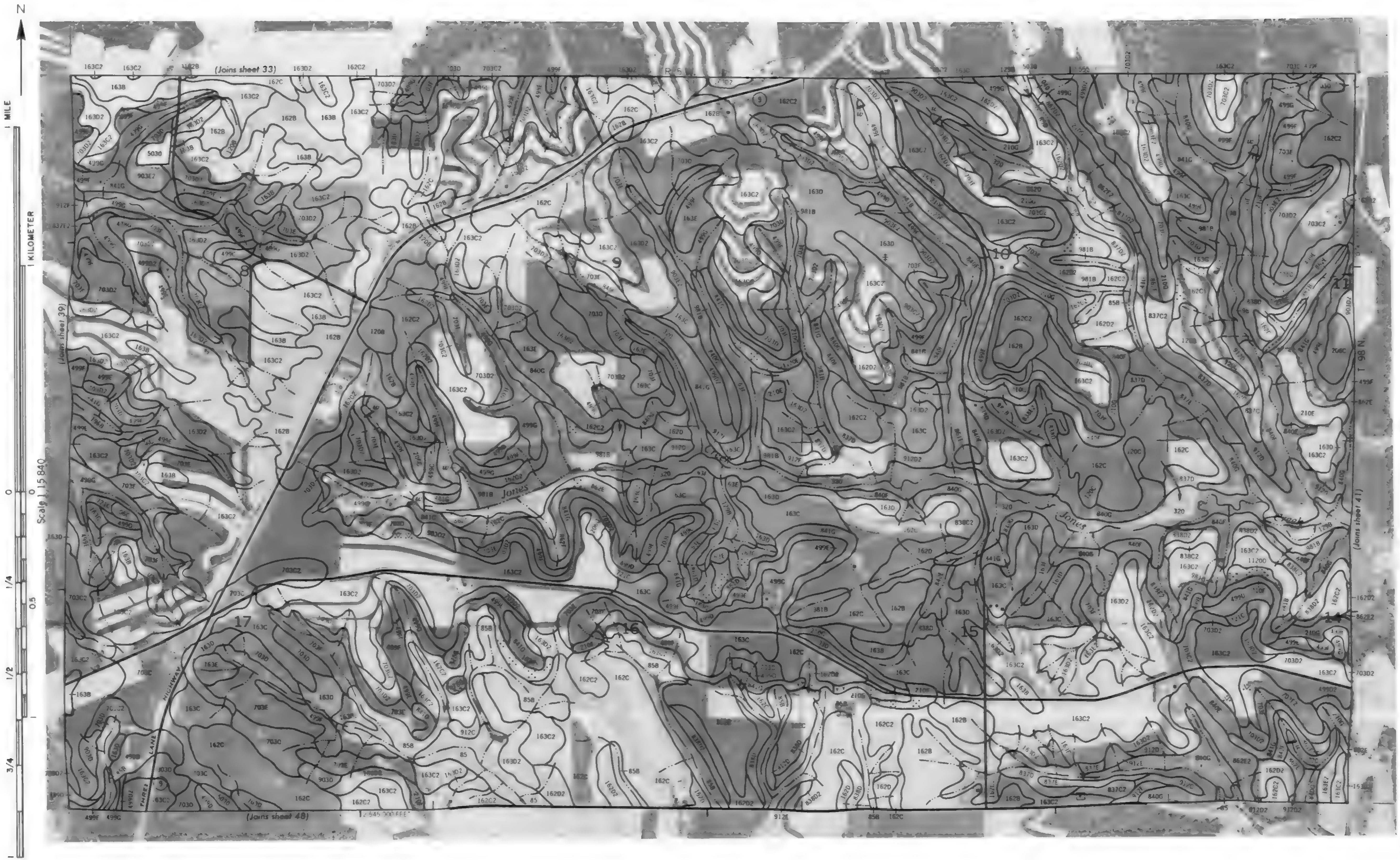
1 KILOMETER

Scale 1:15 840

0 0 1/4 0.5 1/2 3/4

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 4



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

41

ALLAMAKEE COUNTY, IOWA NO. 41

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

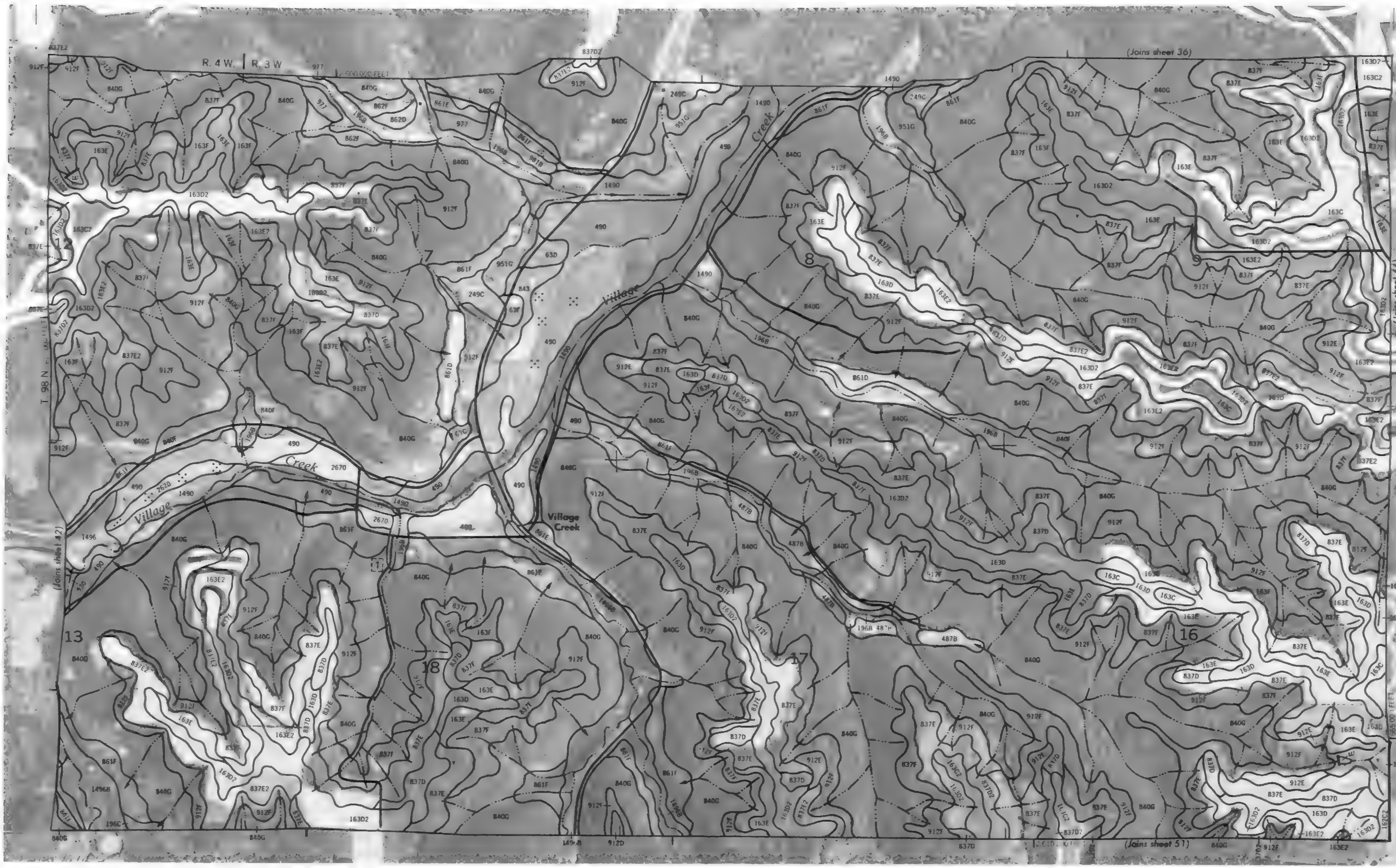
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 42

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 42

ALLAMAKEE COUNTY, IOWA NO. 43

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

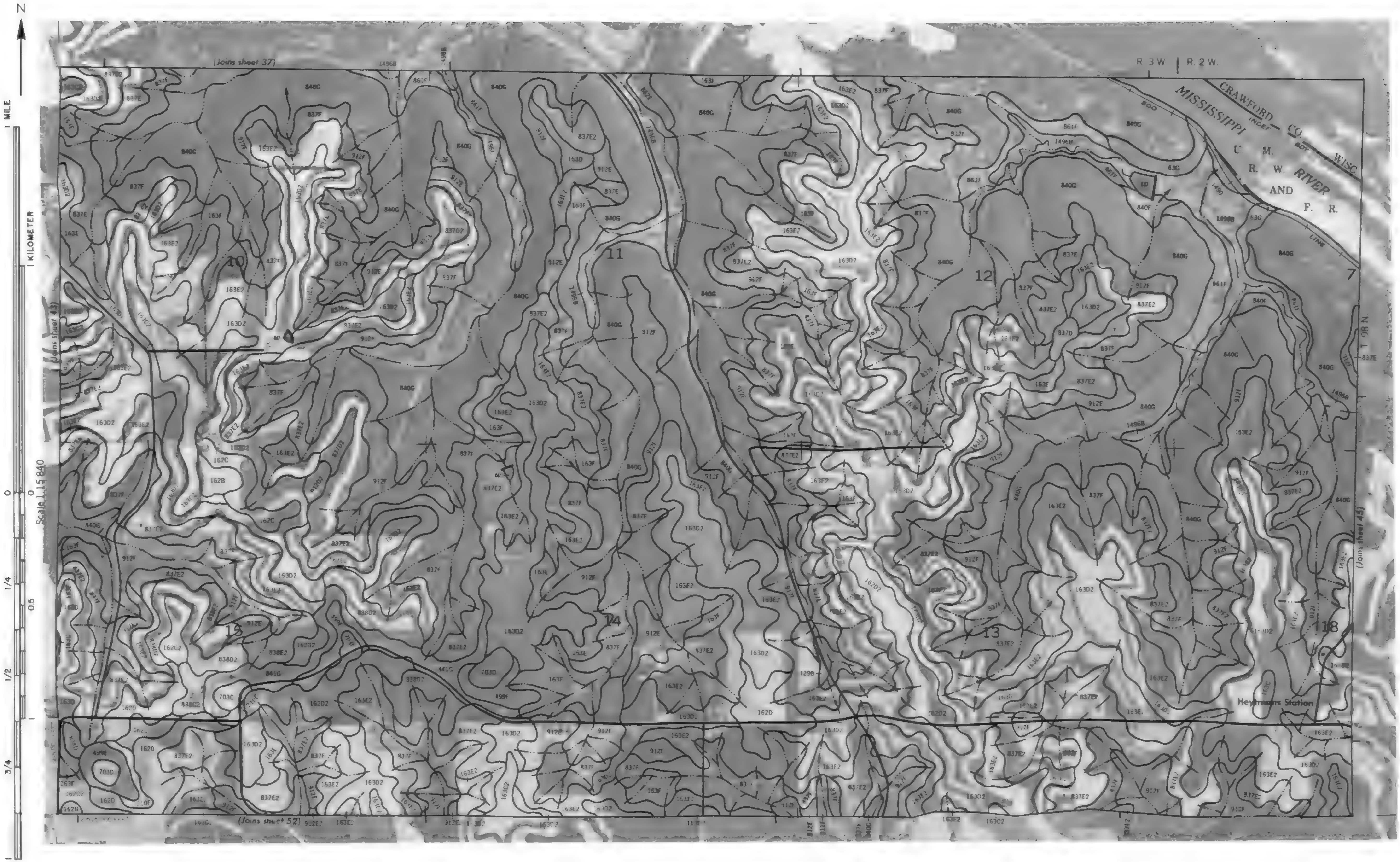


N

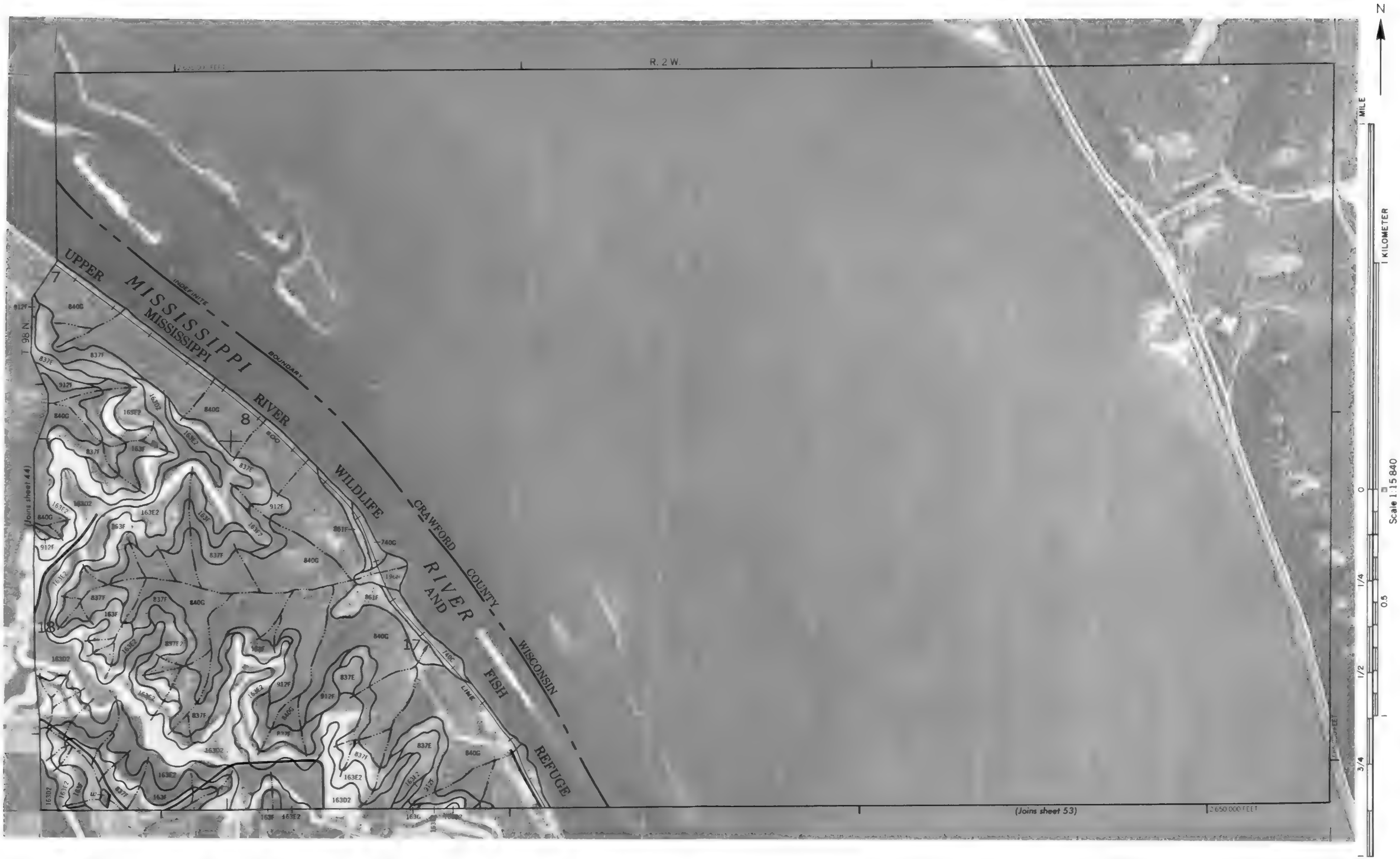
Scale 1:15 840

1 MILE
1 KILOMETER
0
1/4
0.5
1/2
3/4
5000 FEET

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 44



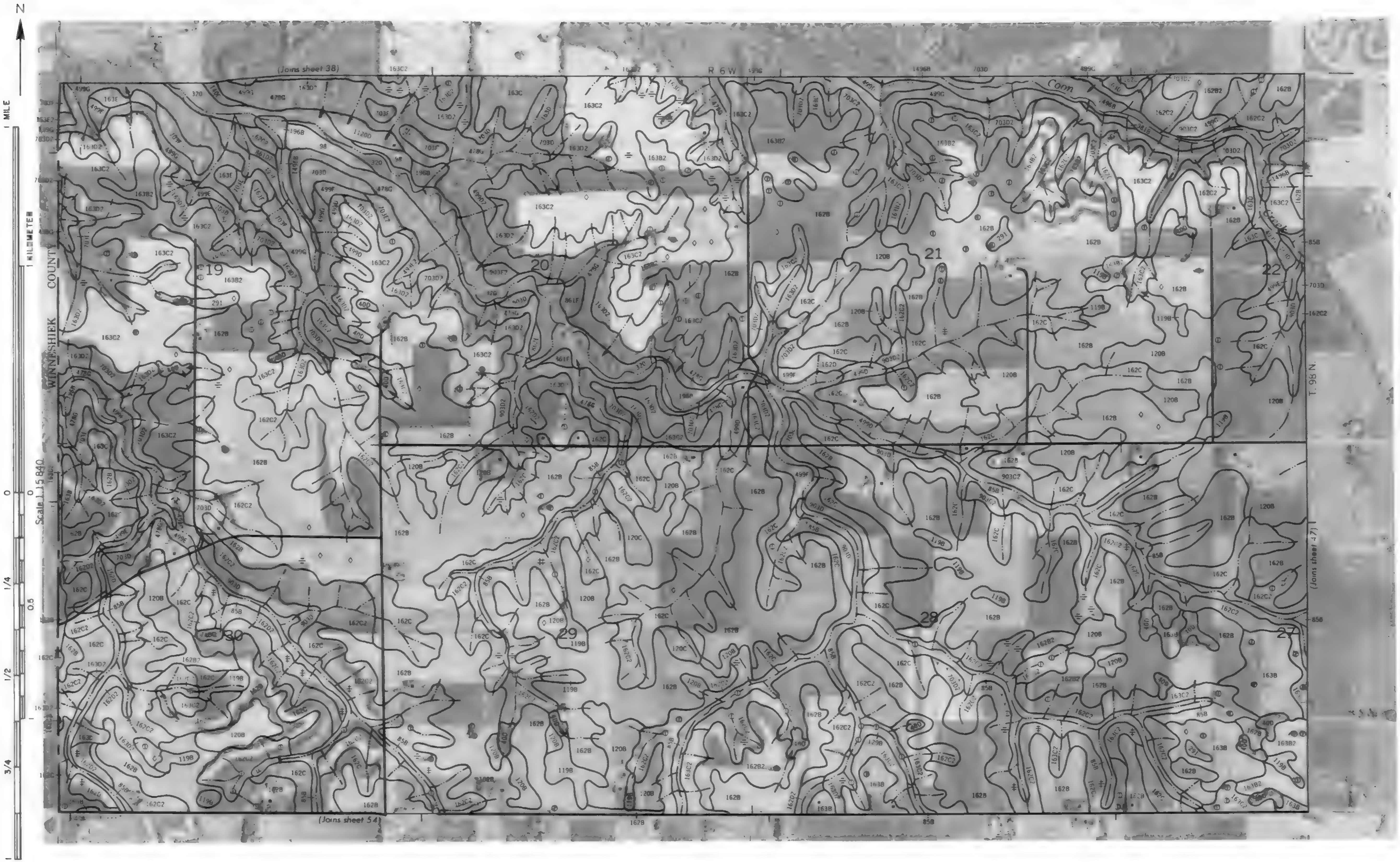
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned



ALLAMAKEE COUNTY, IOWA NO. 45

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 46

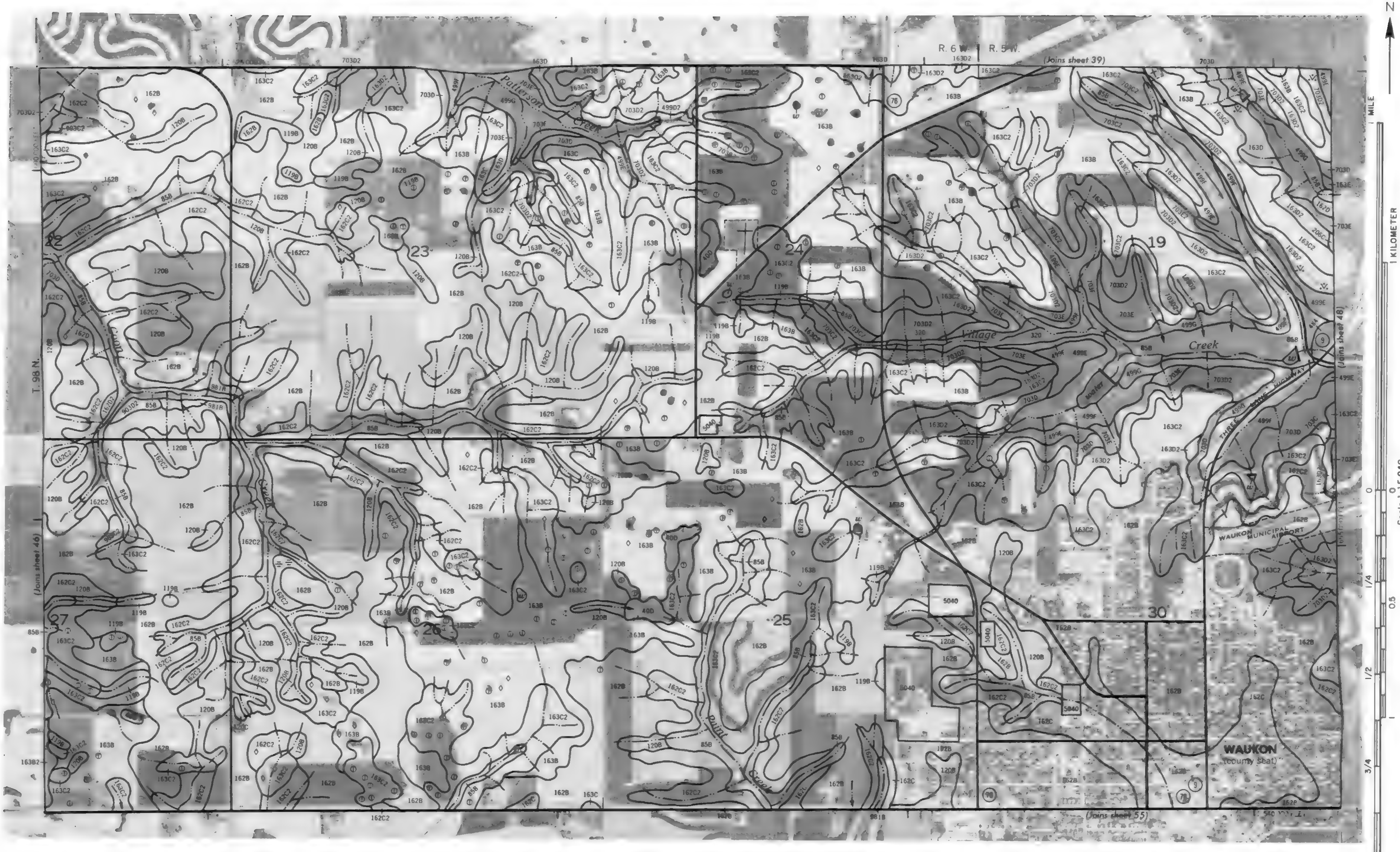


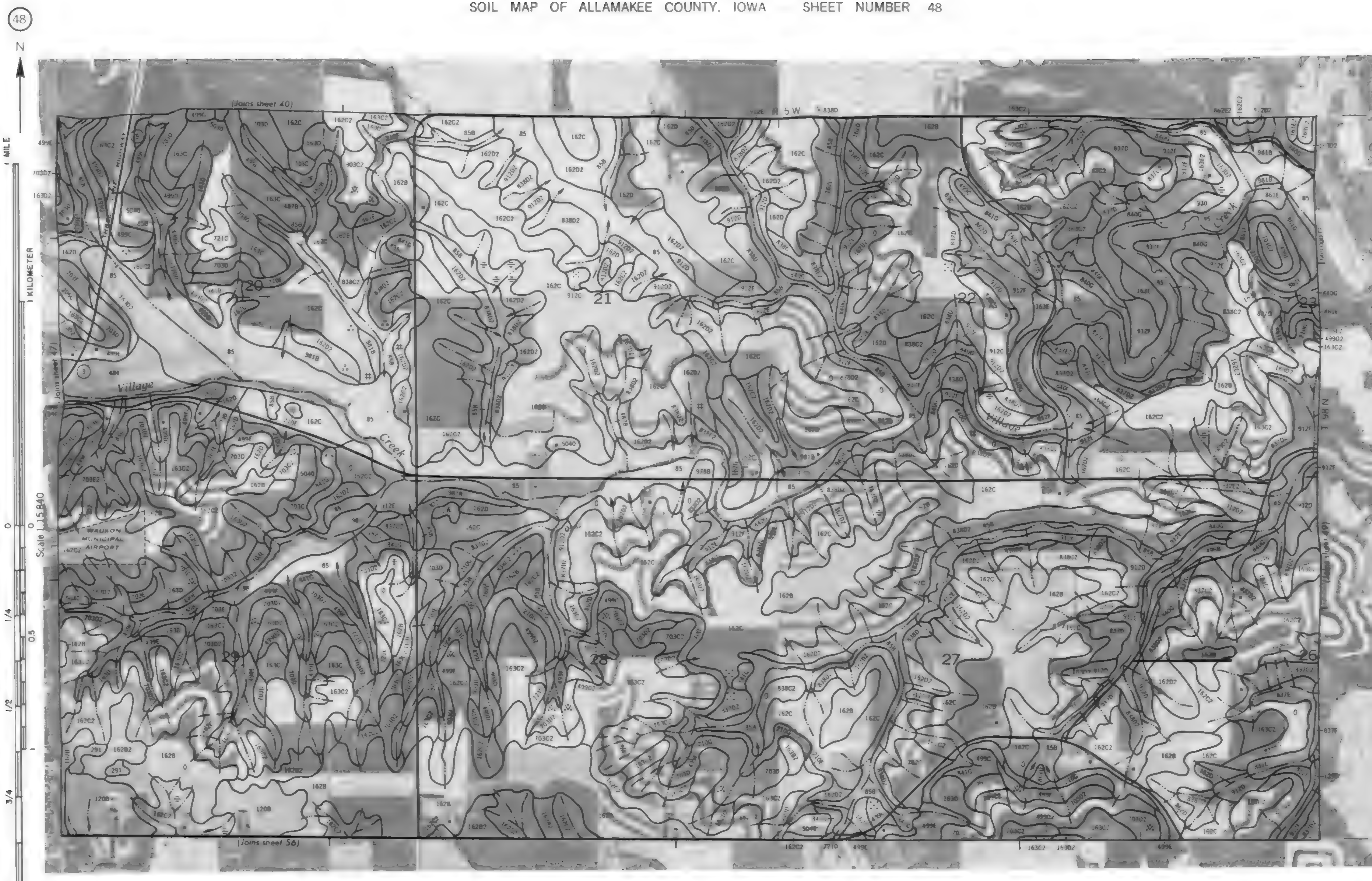
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 46

ALLAMAKEE COUNTY, IOWA NO. 47

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



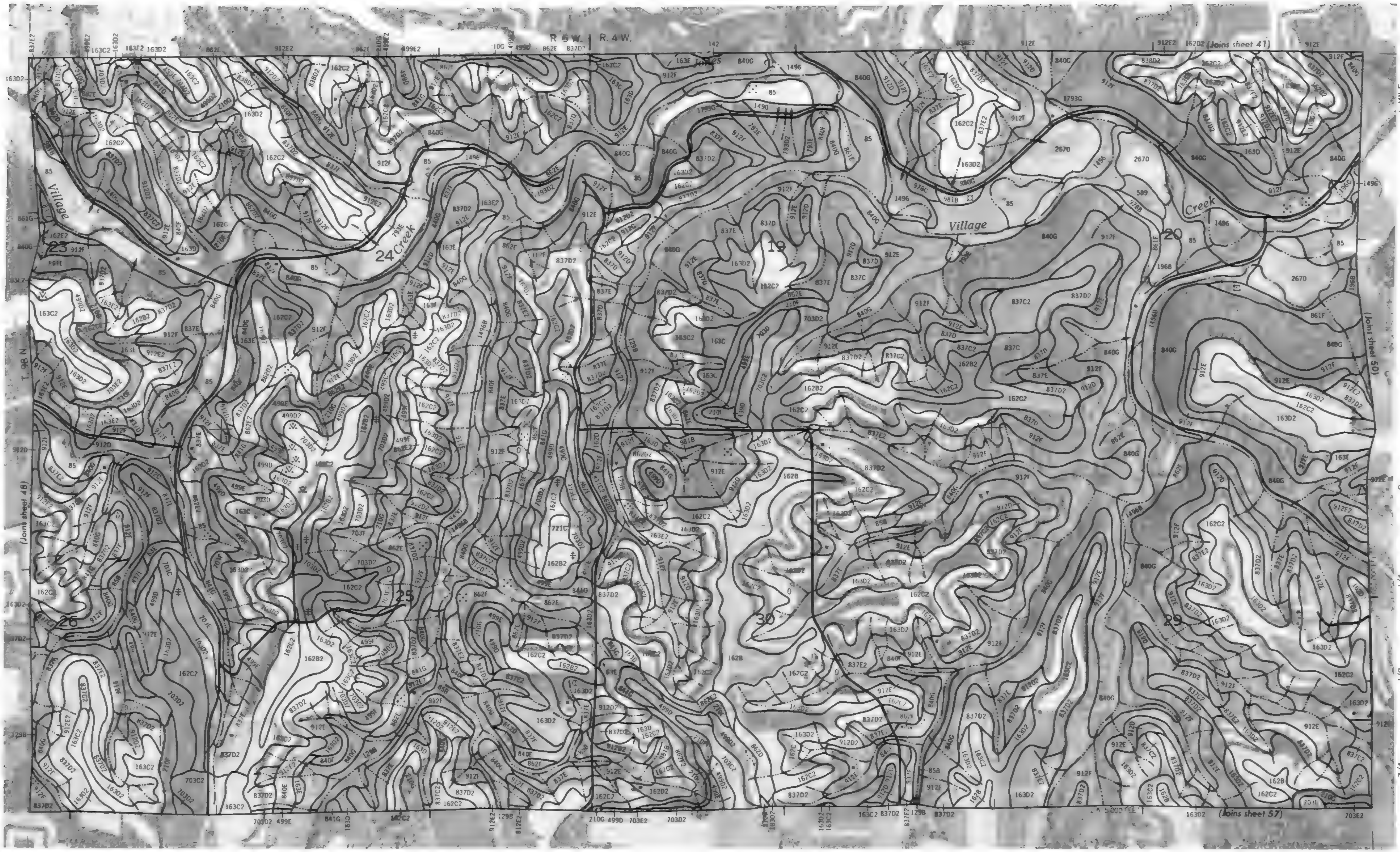


This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 48

ALLAMAKEE COUNTY, IOWA NO. 49

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0 0.5

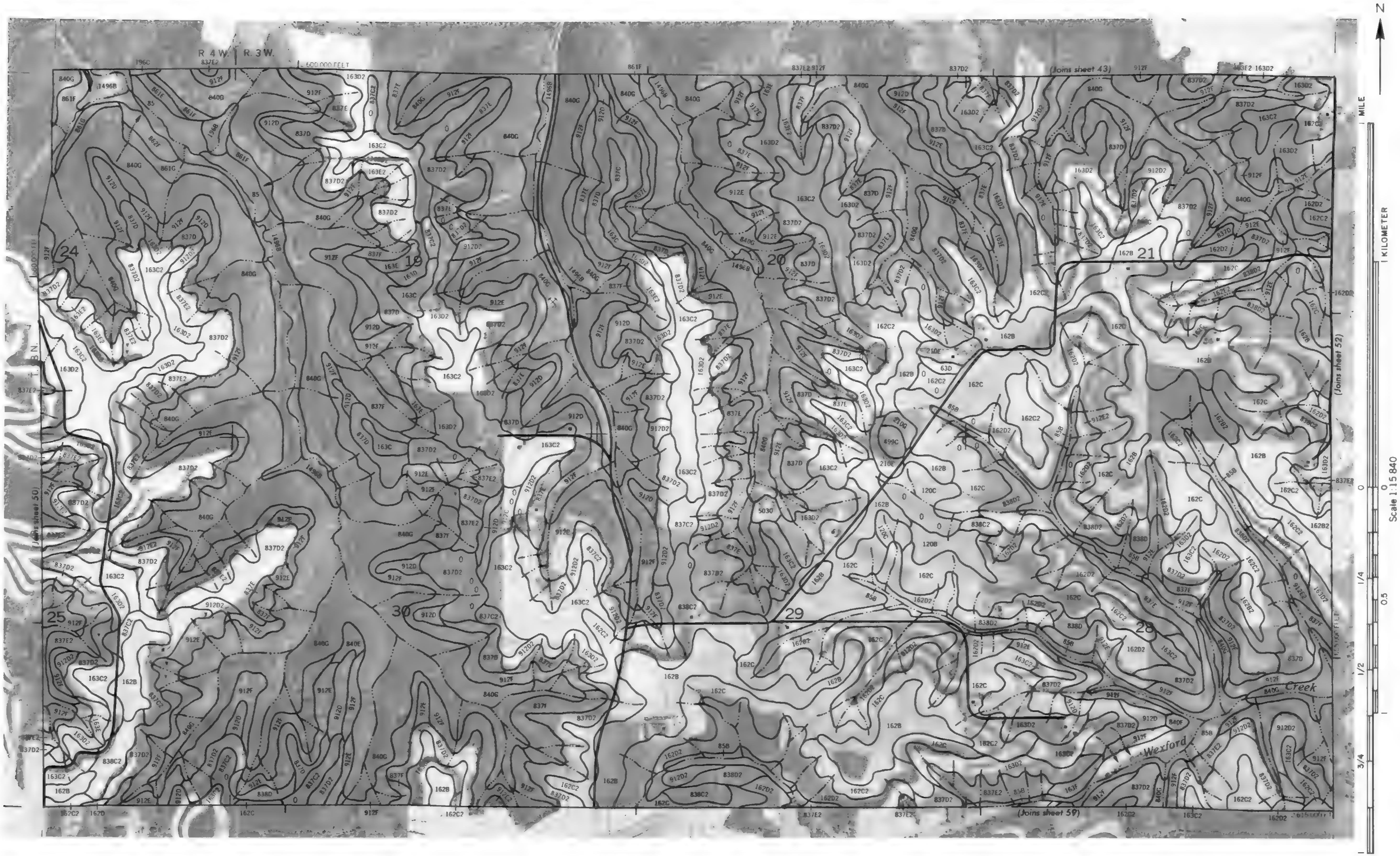
5

ALLAMAKEE COUNTY, IOWA NO. 5

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 50

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLAMAKEE COUNTY, IOWA NO. 51

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

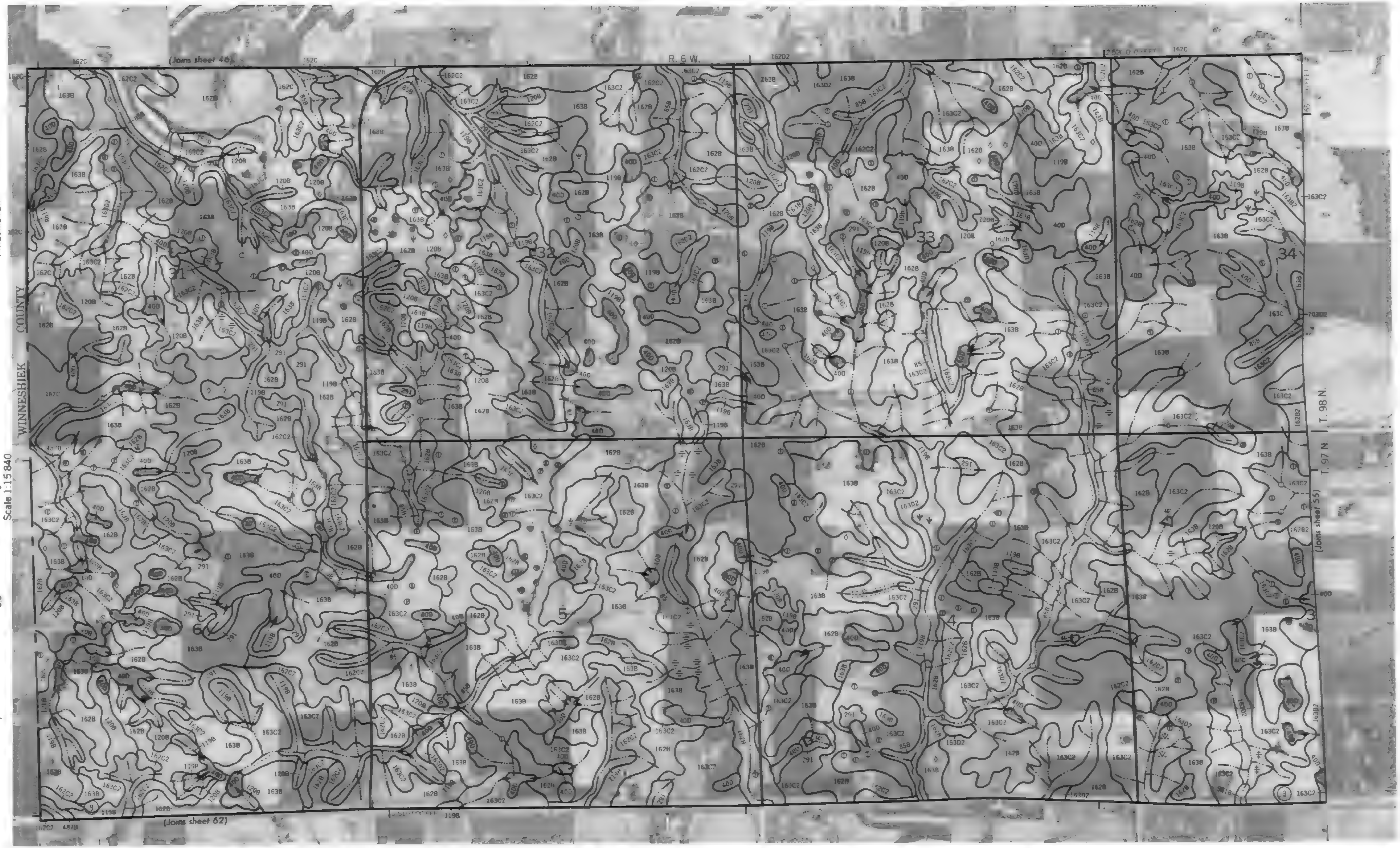
ALLAMAKEE COUNTY, IOWA NO. 53

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 54

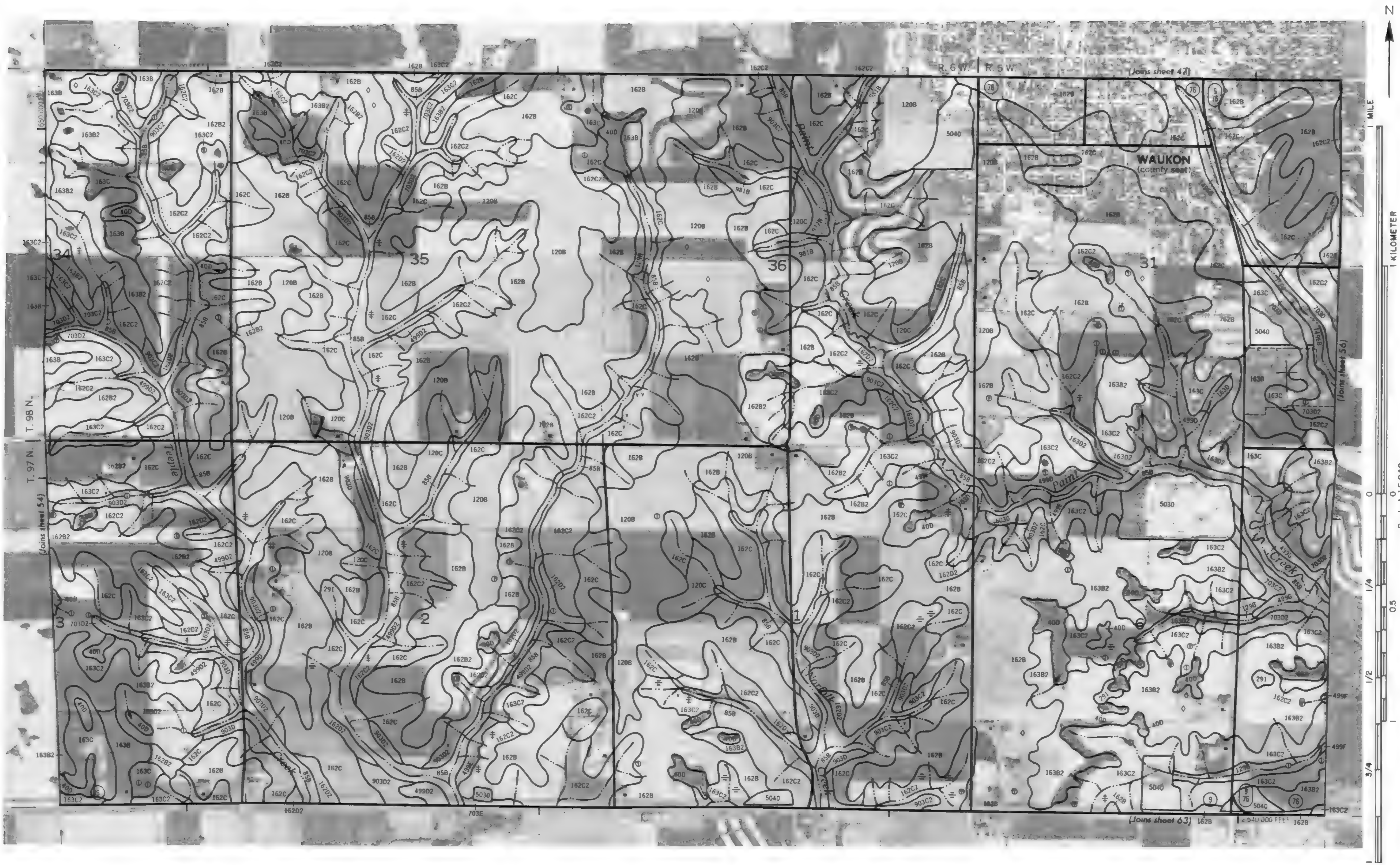
N

1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
0.5
1/2
3/4



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

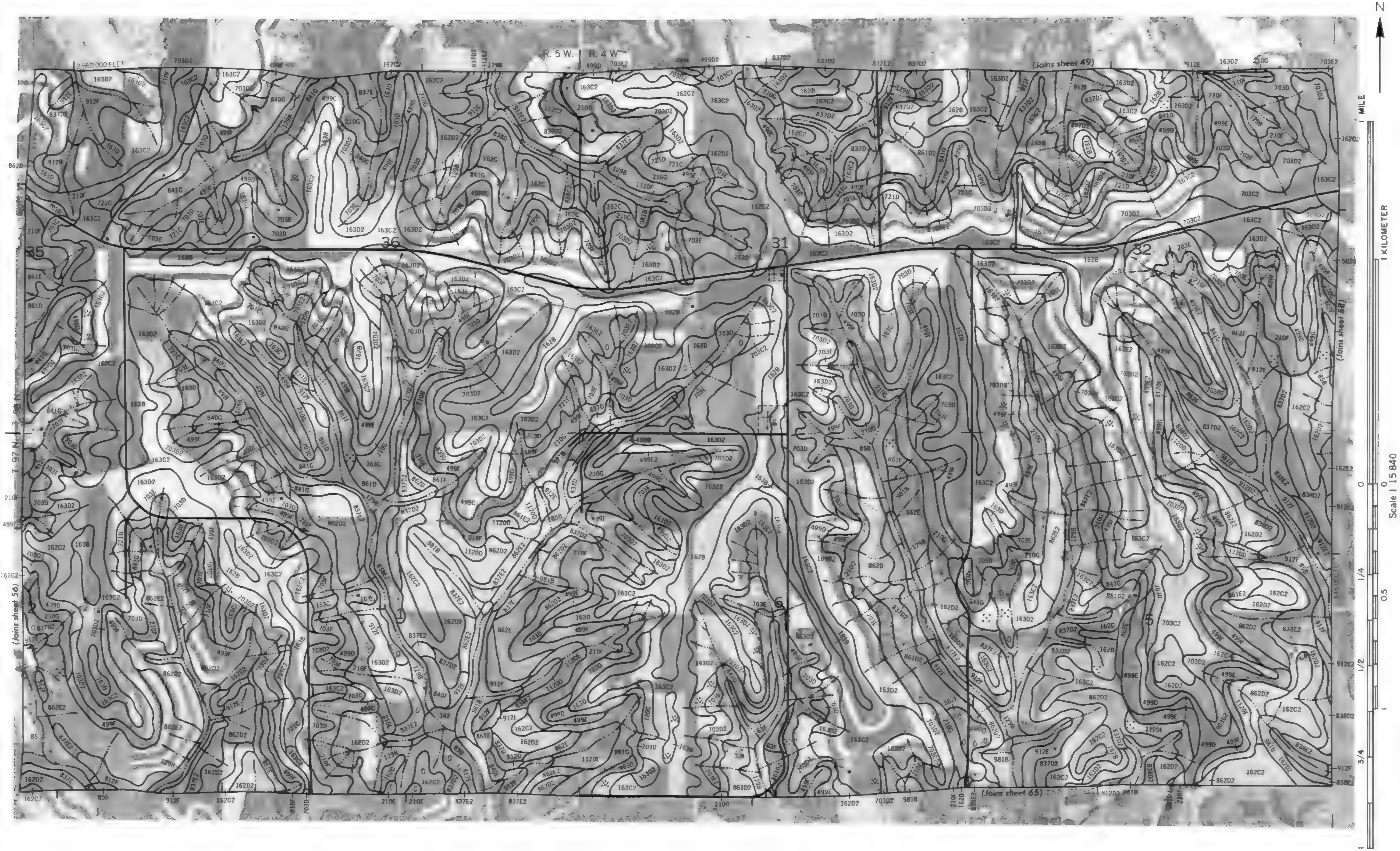
ALLAMAKEE COUNTY, IOWA NO. 54



ALLAMAKEE COUNTY, IOWA NO. 55

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

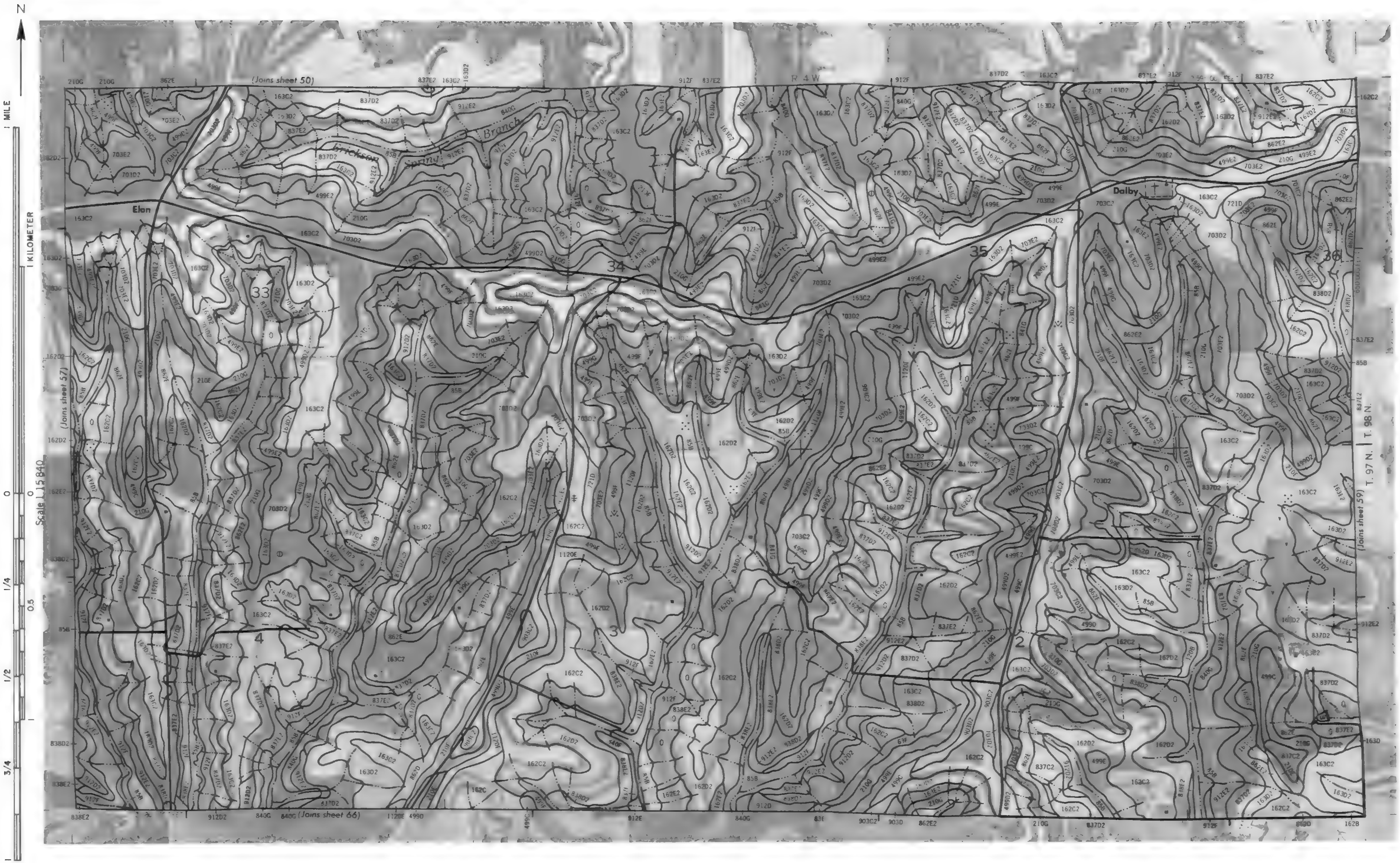
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLAMAKEE COUNTY, IOWA NO. 57

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 58

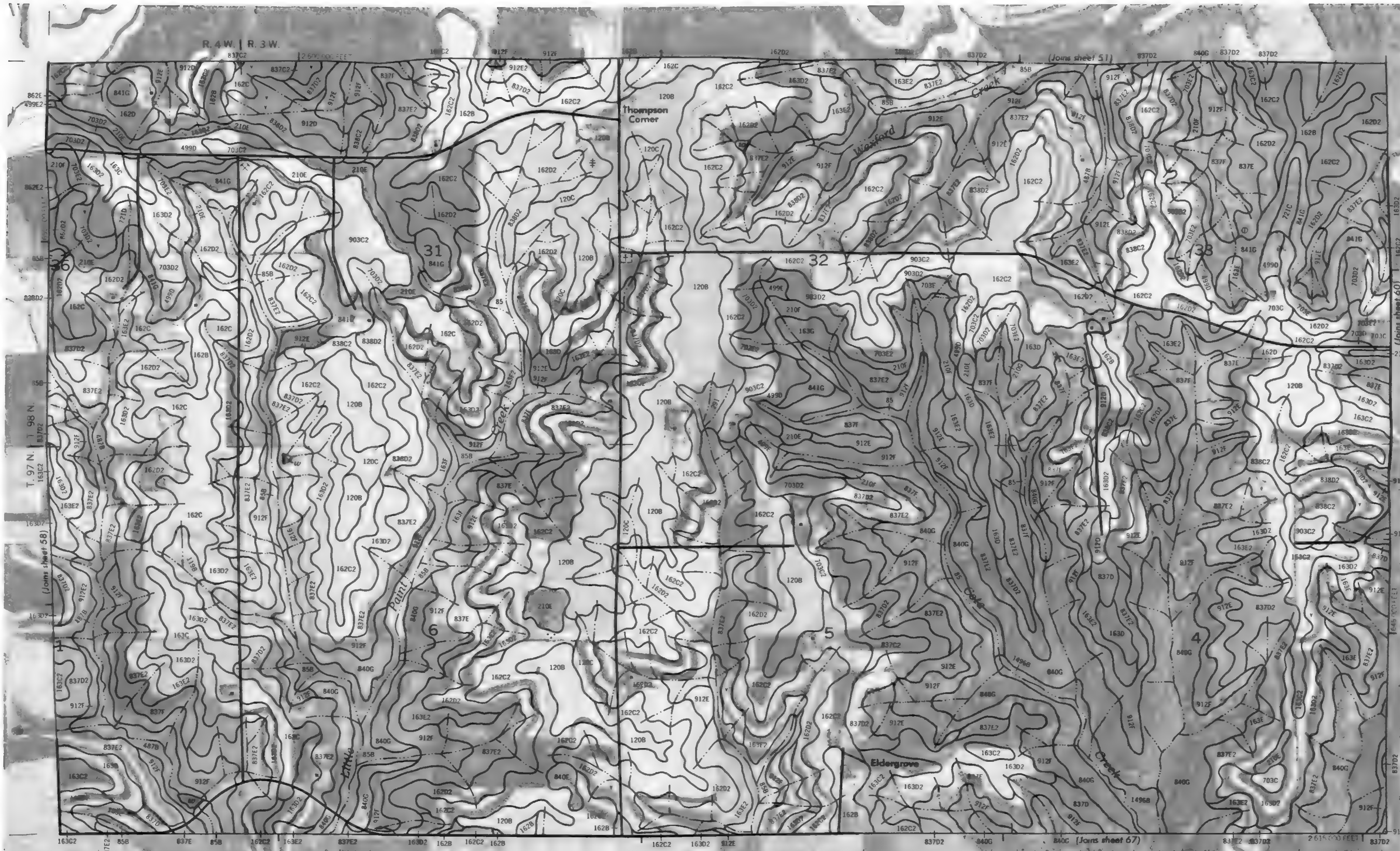


This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 58

59

N



ALLAMAKEE COUNTY, IOWA NO. 59

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MILE
1 KILOMETER
Scale 1:15 840

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 6

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 60

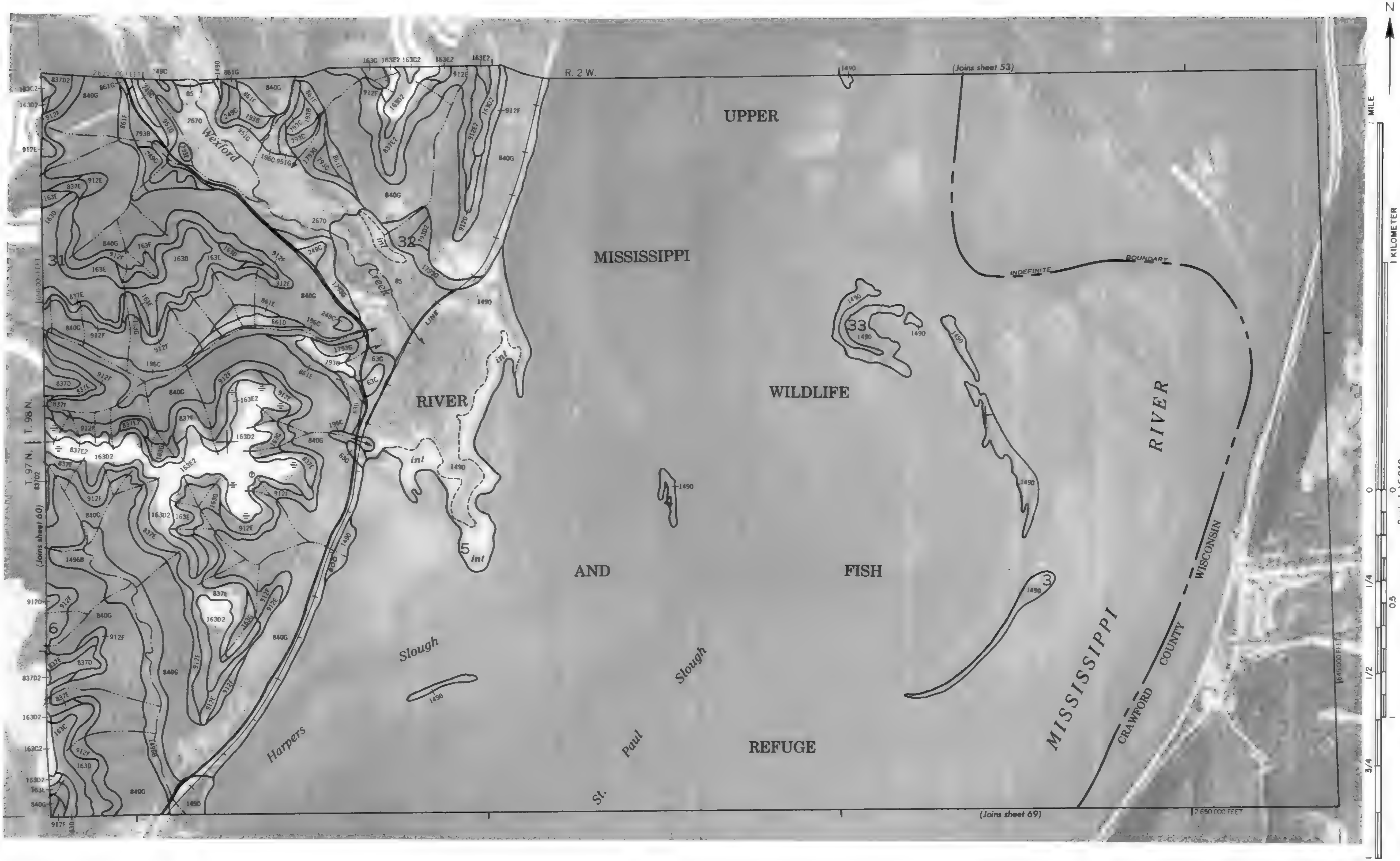
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 60

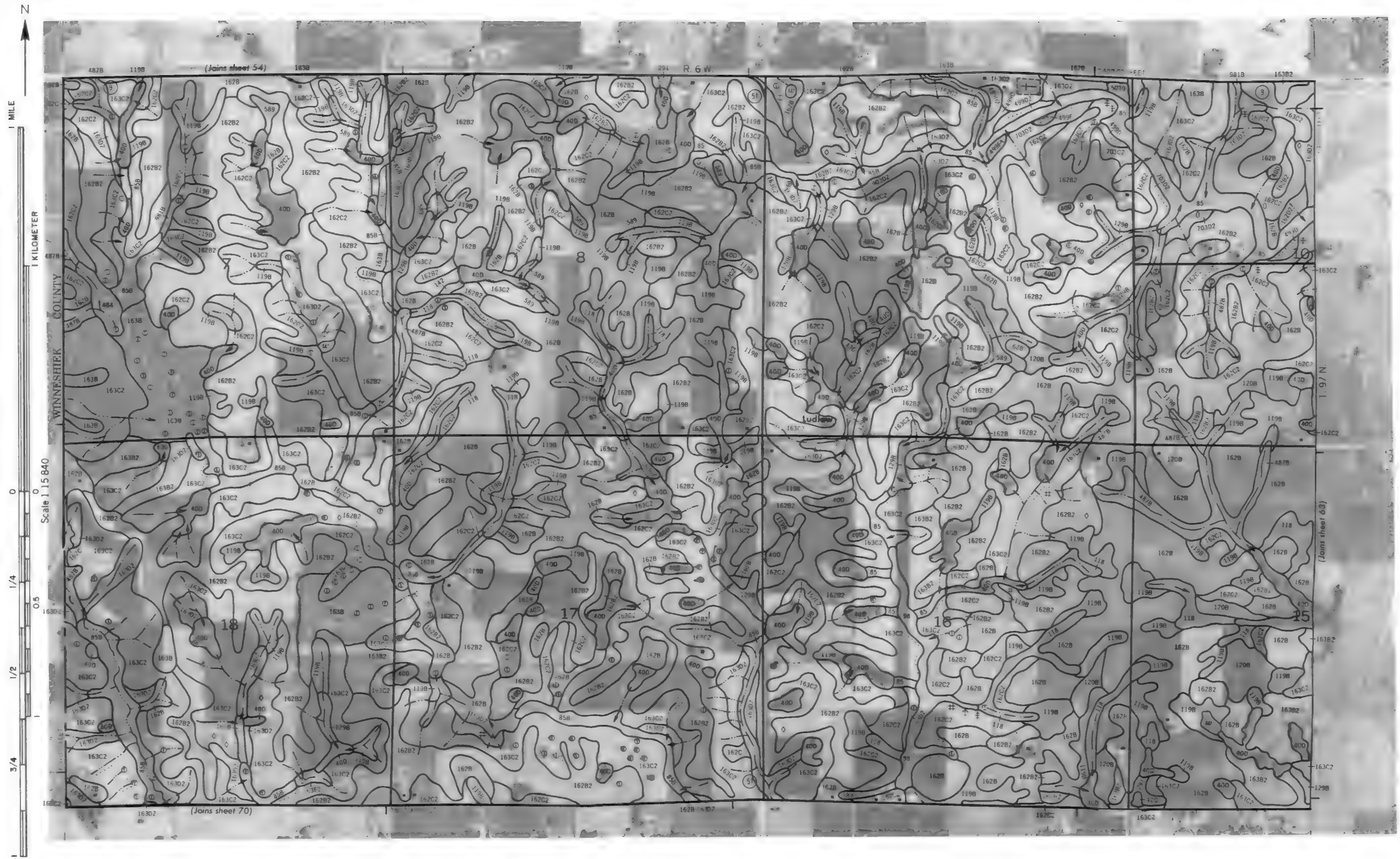
ALLAMAKEE COUNTY, IOWA NO. 61

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned



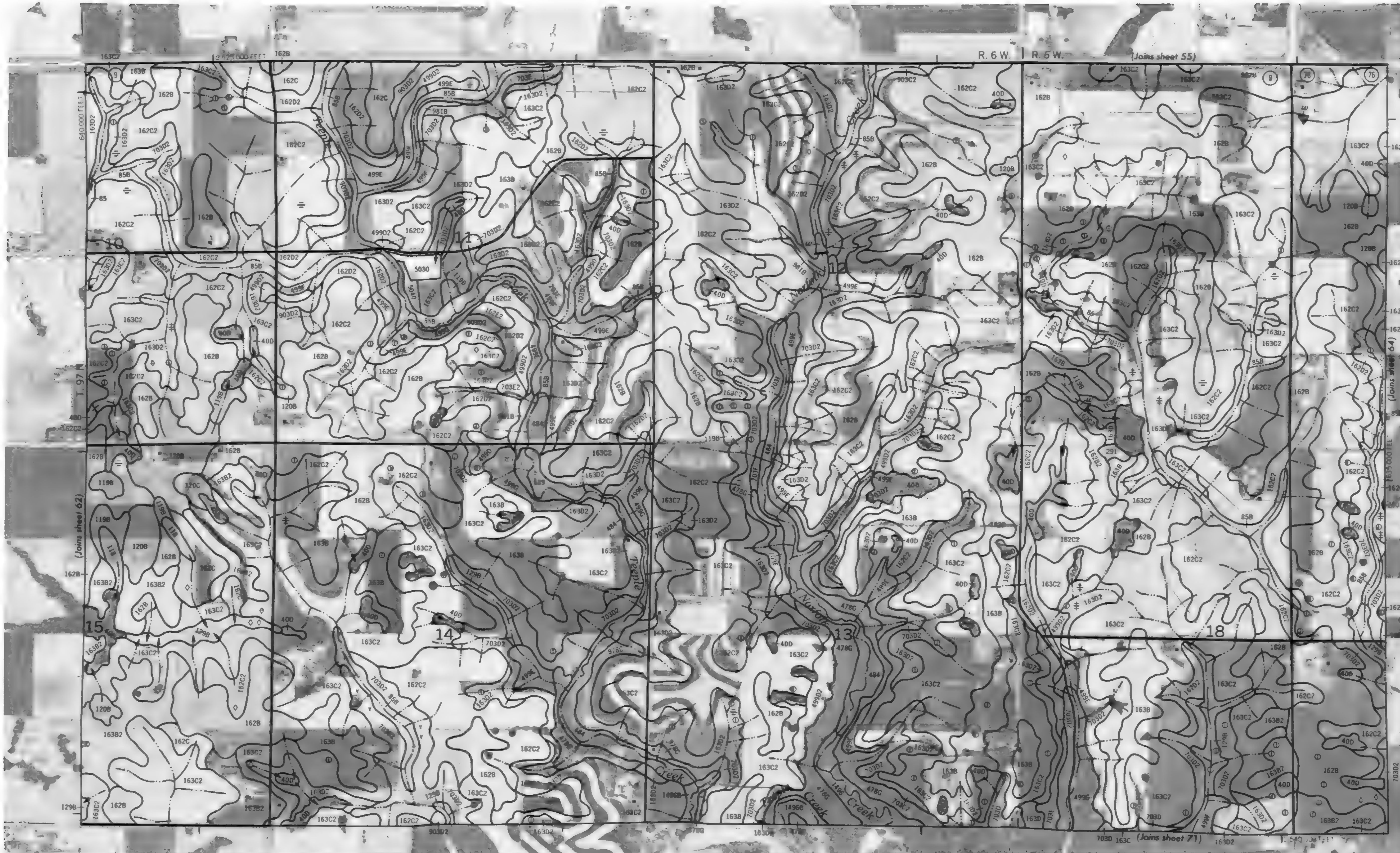
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 62



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

63

N



ALLAMAKEE COUNTY, IOWA NO. 63

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 MILE

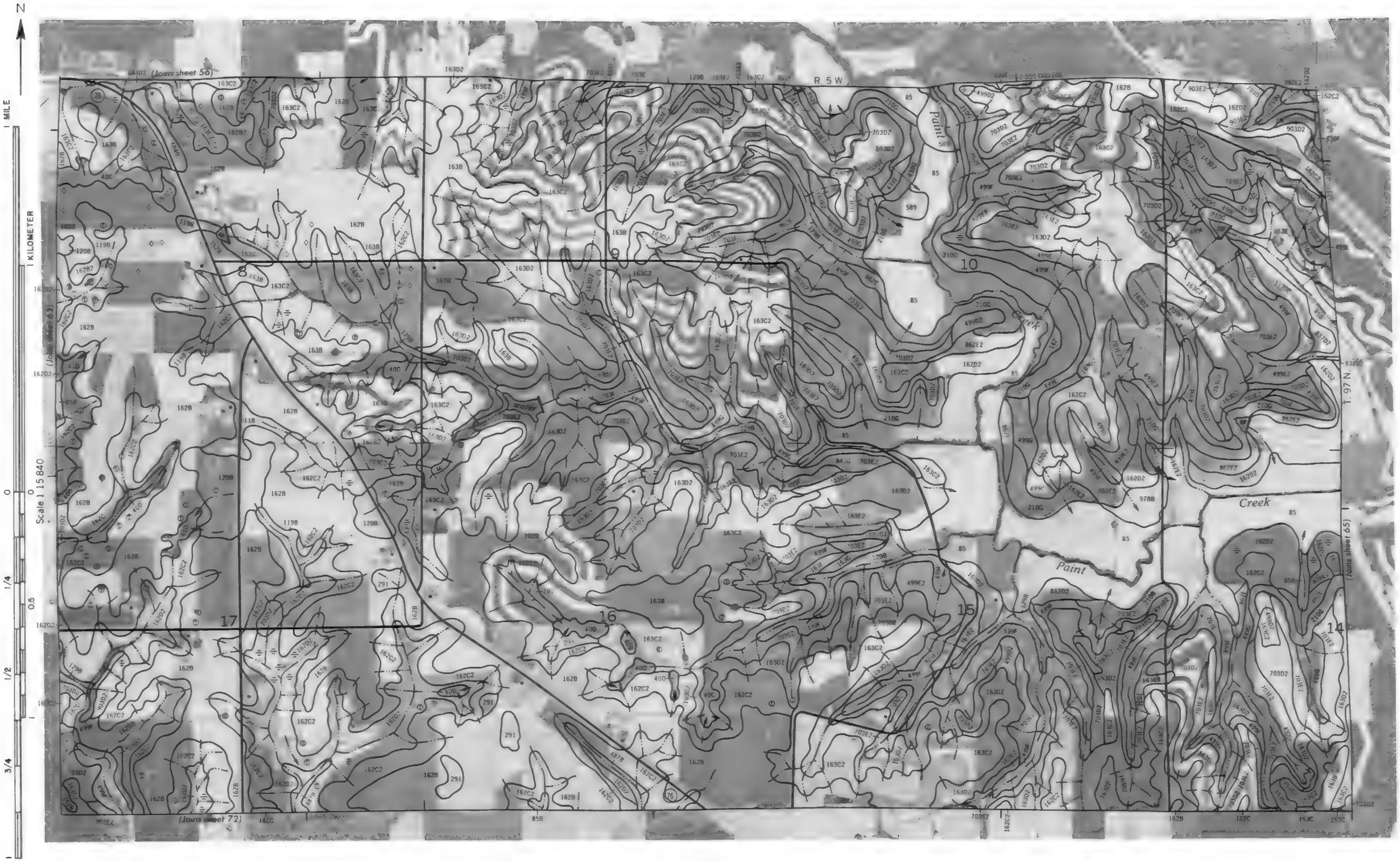
1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0 0.5

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 64



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 64

N

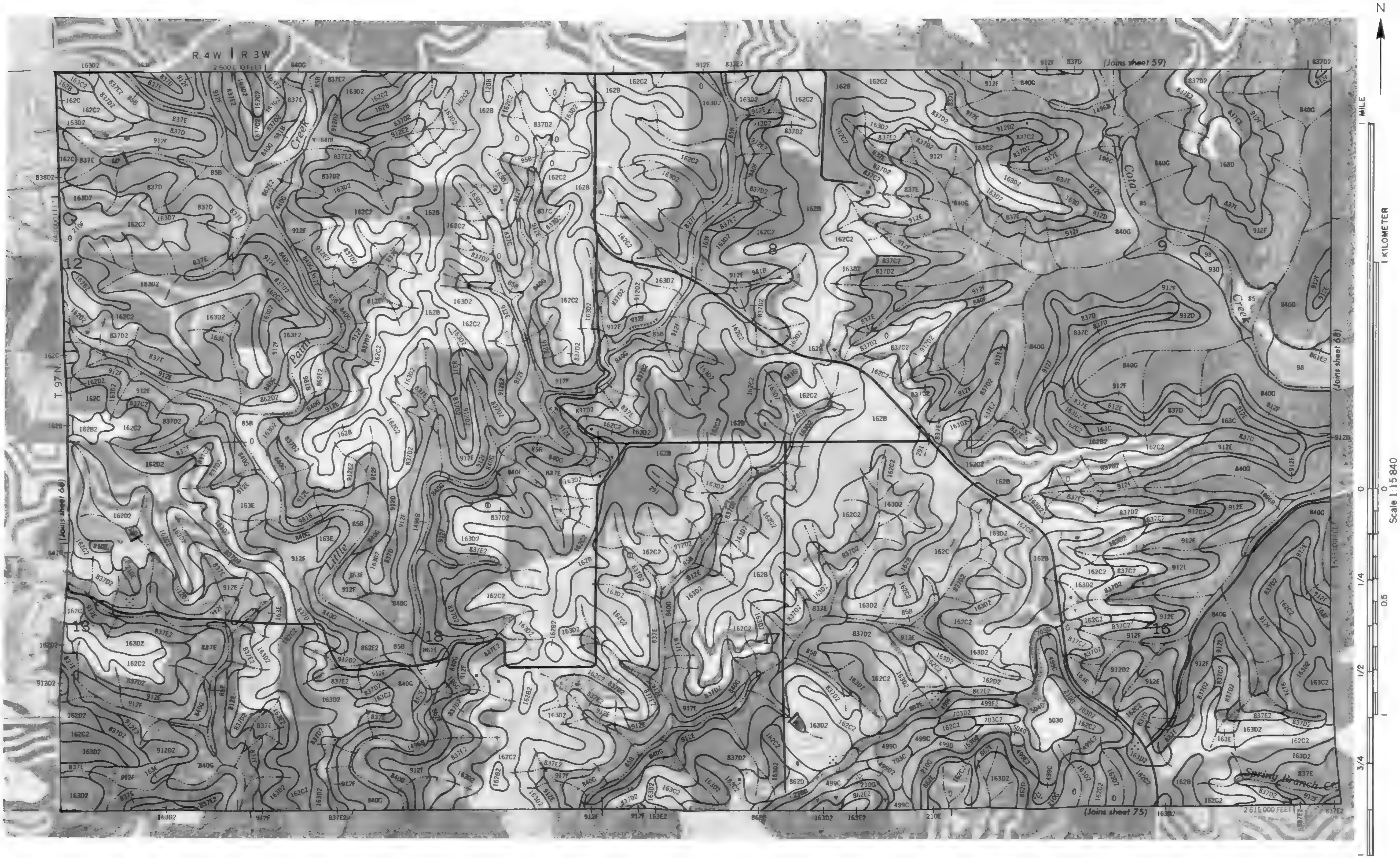
ALLAMAKEE COUNTY, IOWA NO. 65

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

ALLAMAKEE COUNTY, IOWA NO. 66



ALLAMAKEE COUNTY, IOWA NO. 67

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 68

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

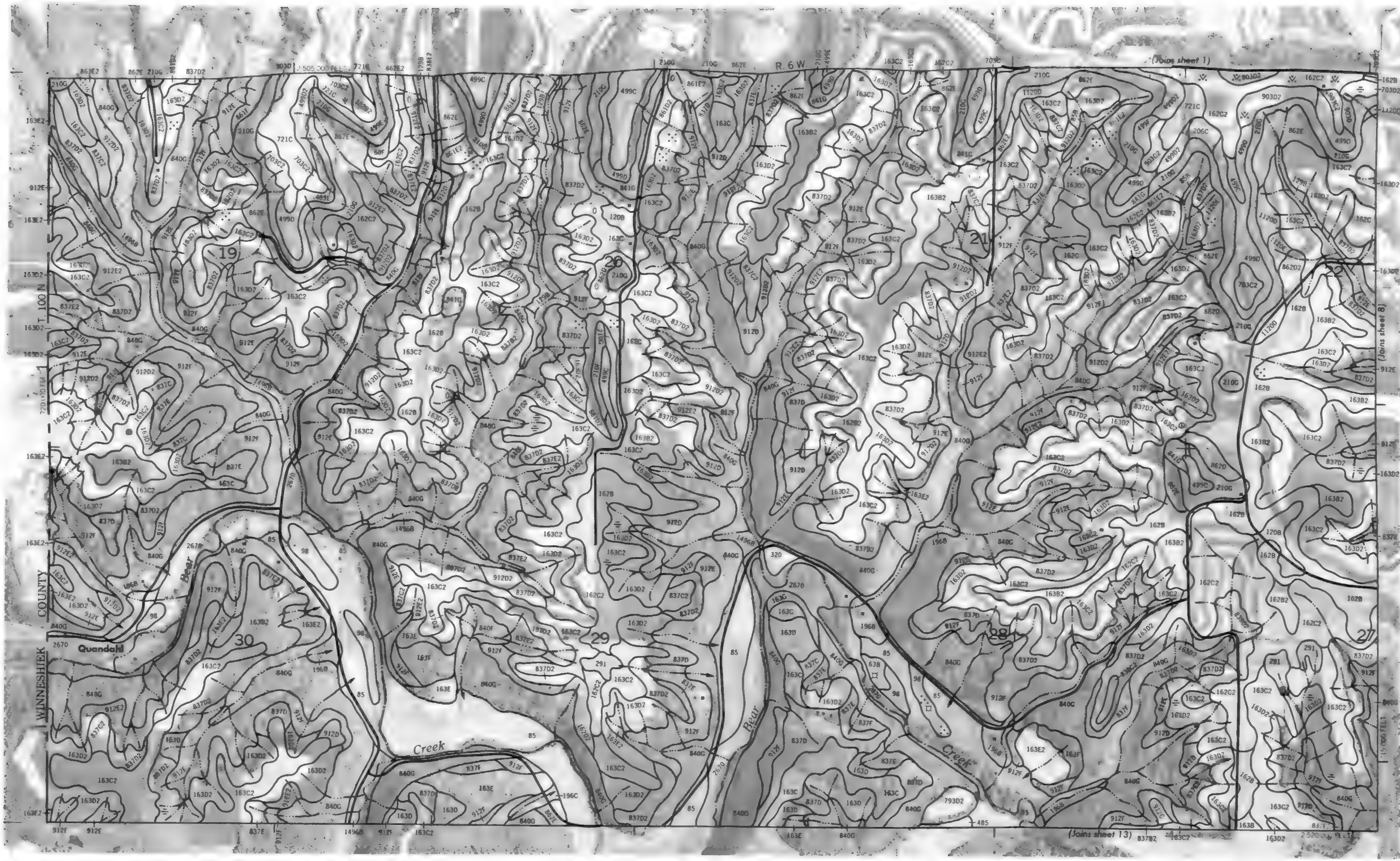
ALLAMAKEE COUNTY, IOWA NO. 68

69

ALLAMAKEE COUNTY, IOWA NO. 69

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

7



N

MILE

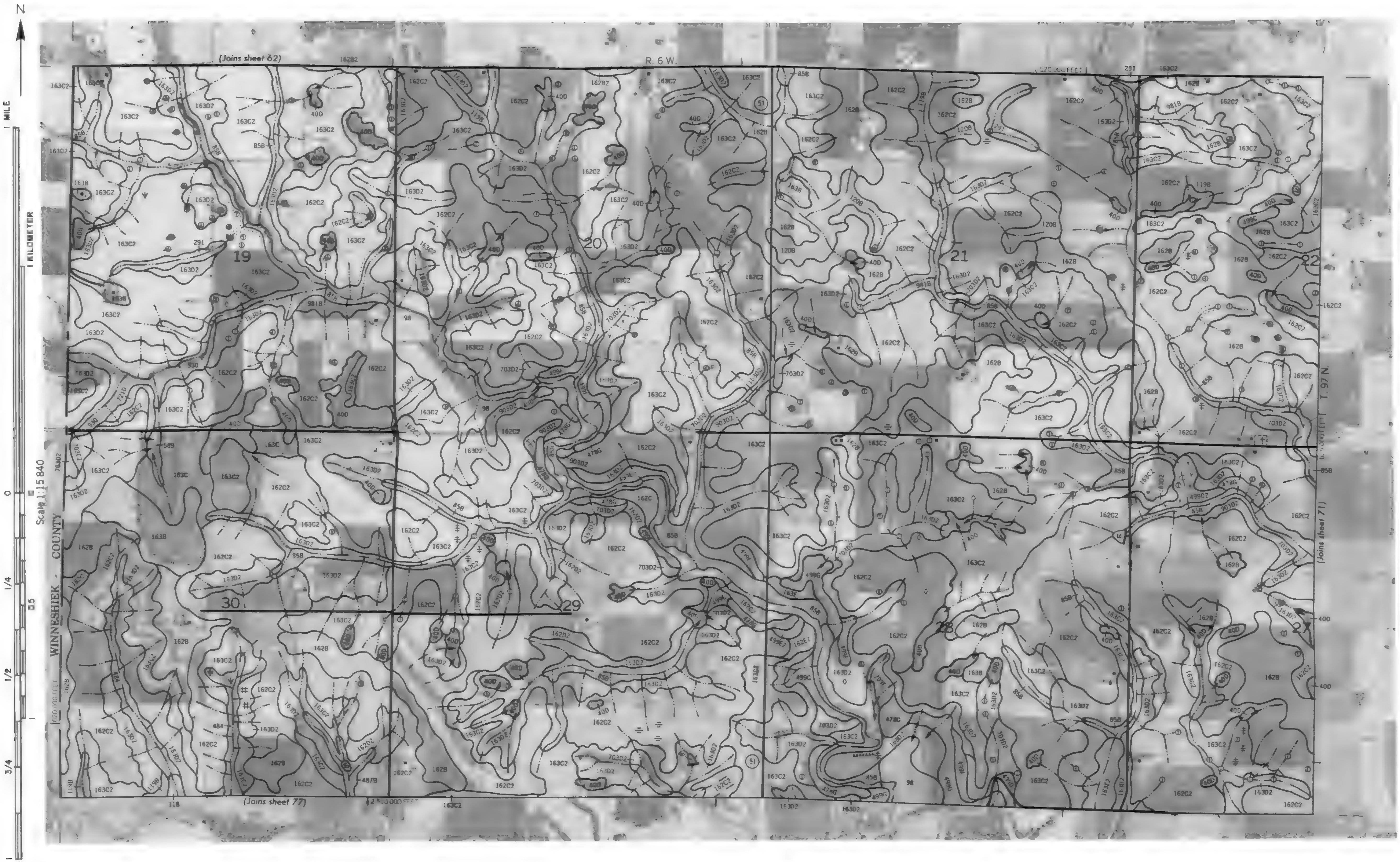
KILOMETER

Scale 1:15 840

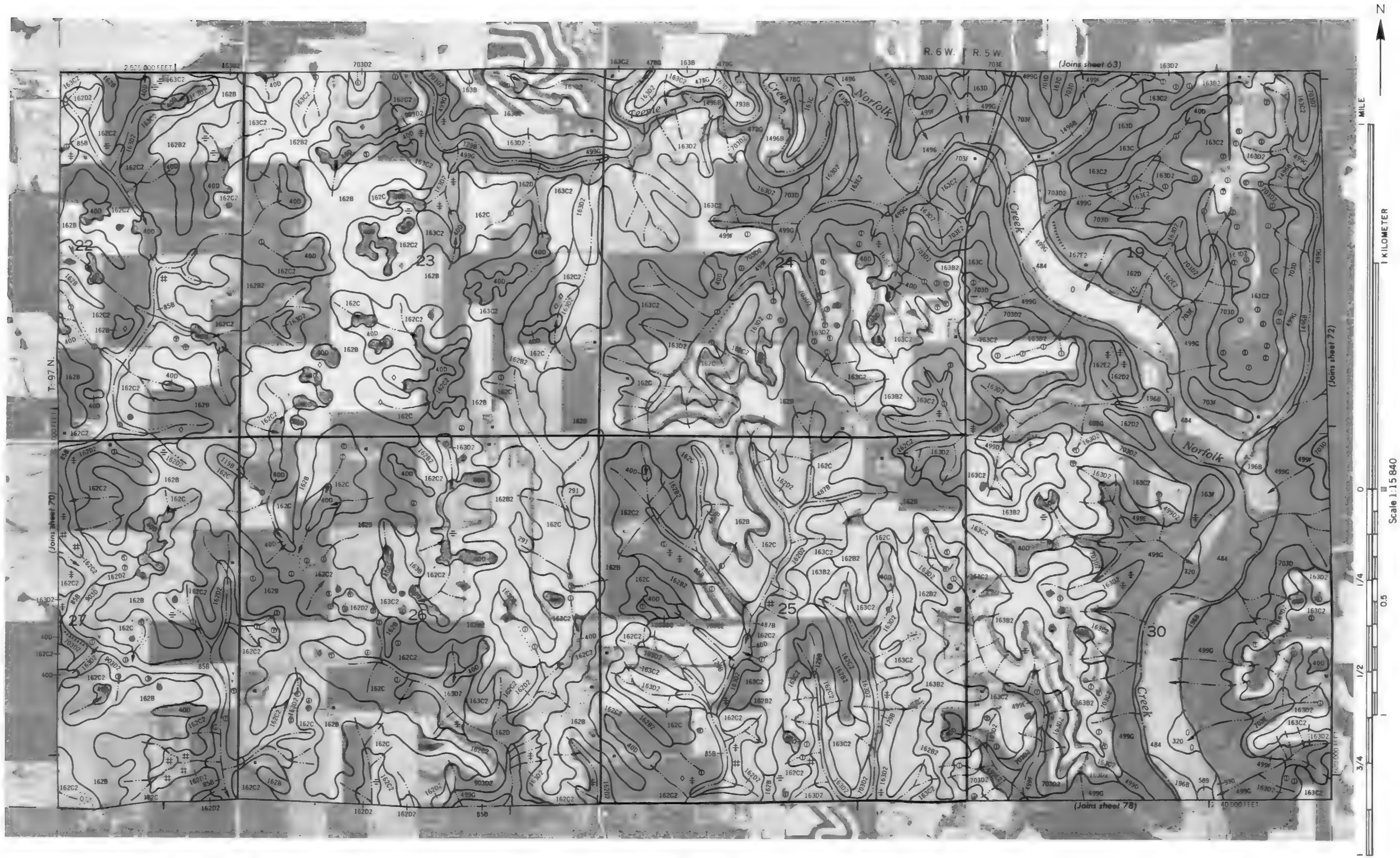
ALLAMAKEE COUNTY, IOWA NO. 7

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 70



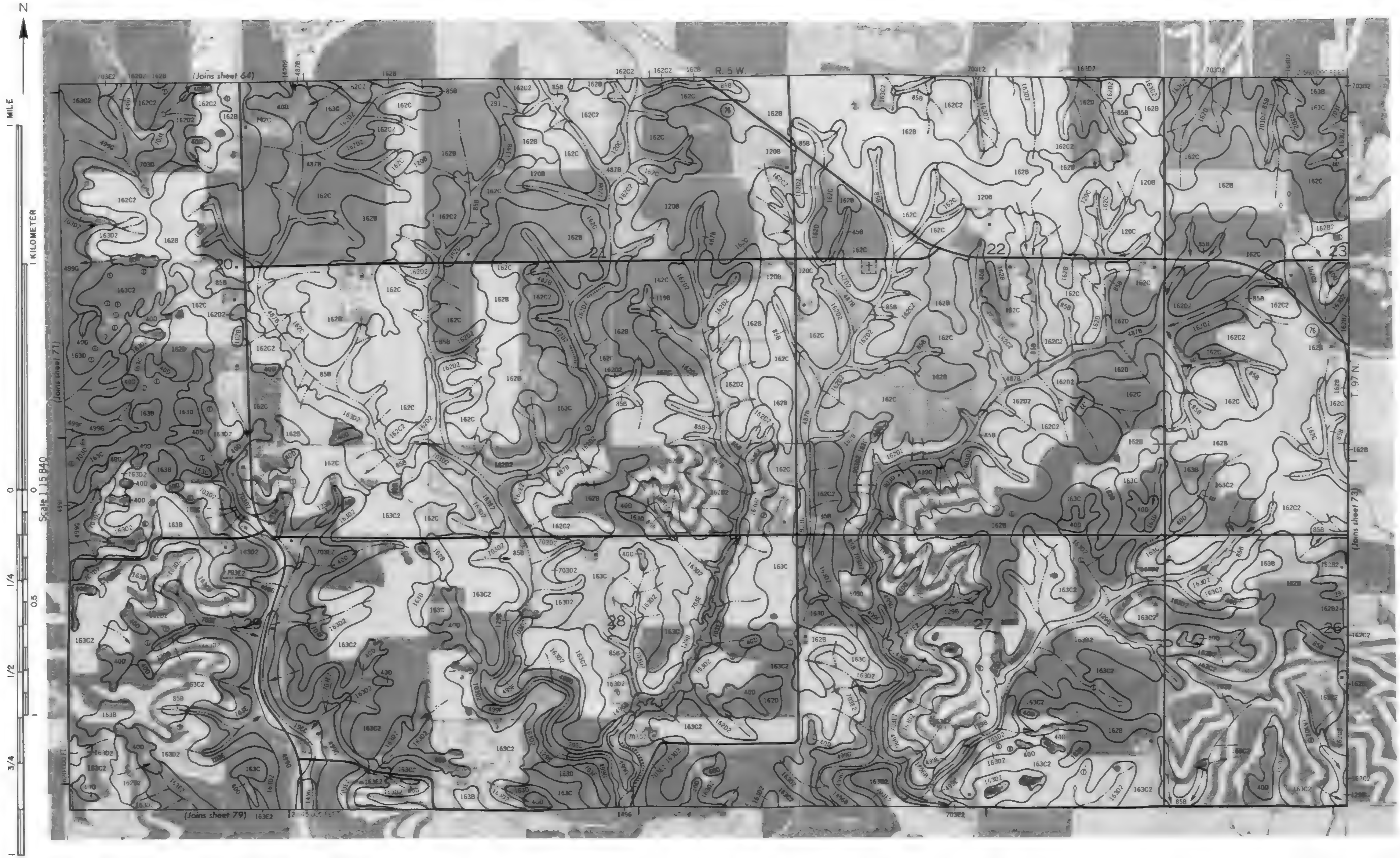
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLAMAKEE COUNTY, IOWA NO. 71

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

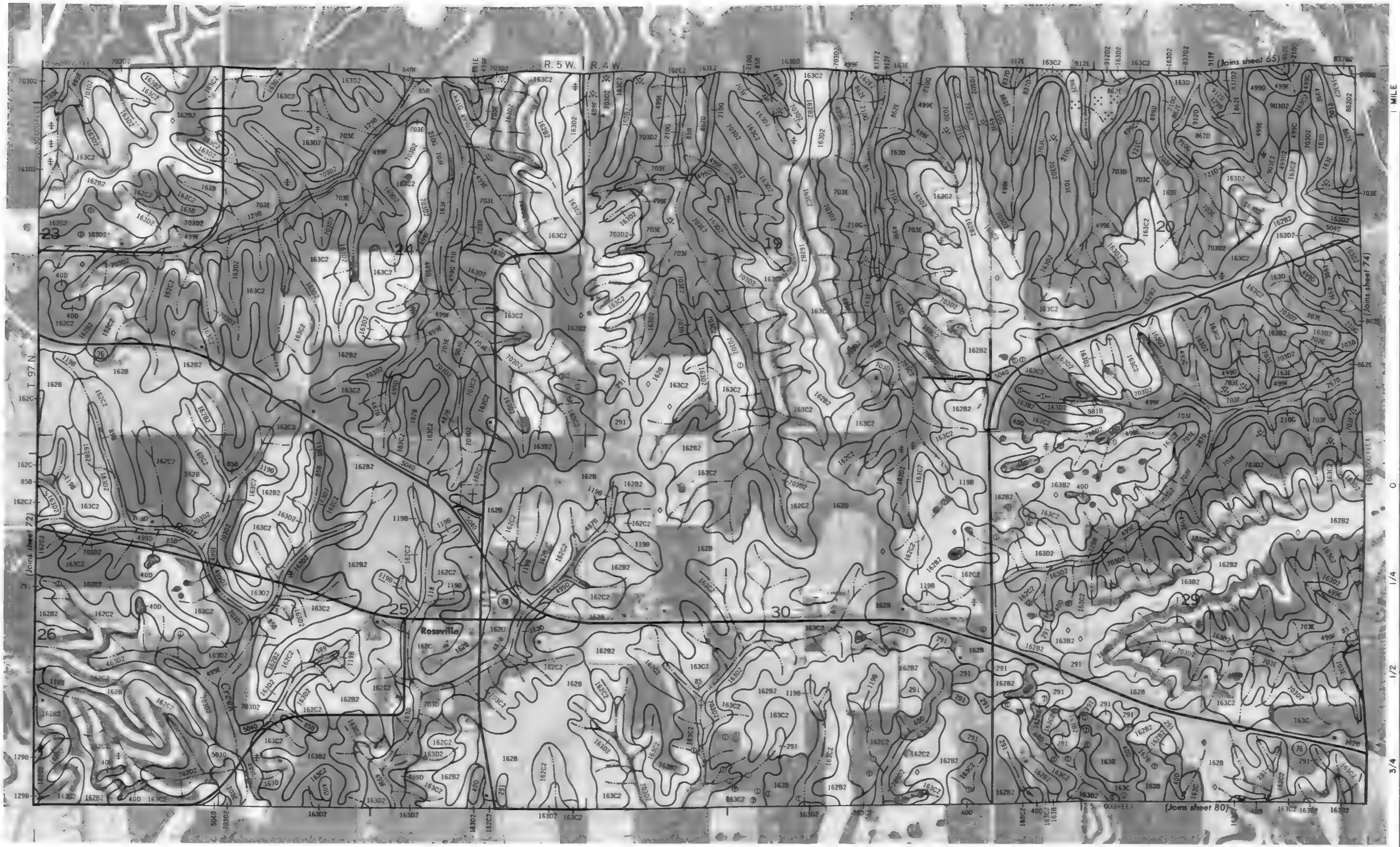
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 72



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

73

N



1 MILE

1 KILOMETER

Scale 1:15 840

ALLAMAKEE COUNTY, IOWA NO. 73

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 74

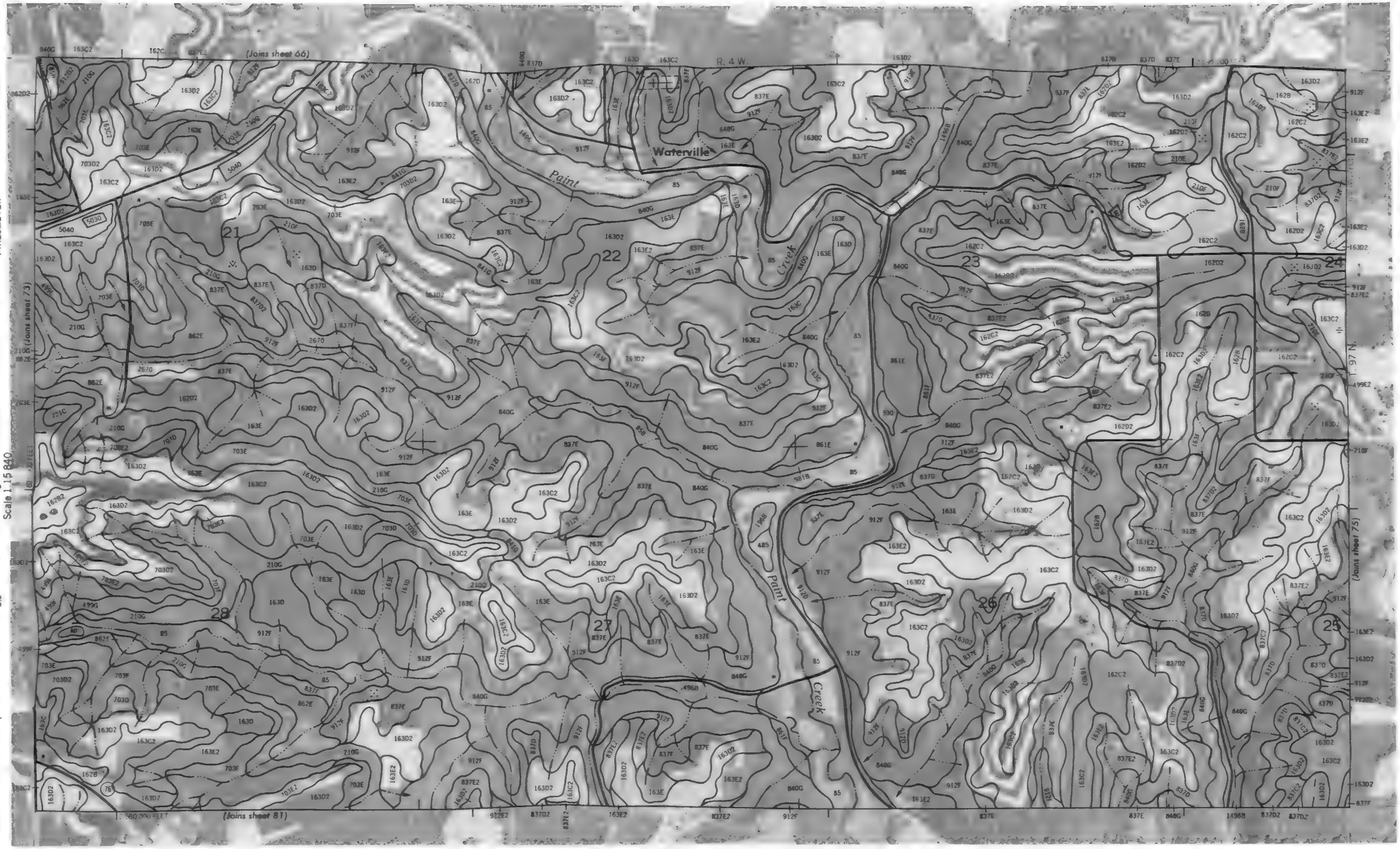
N

1 MILE

1 KILOMETER

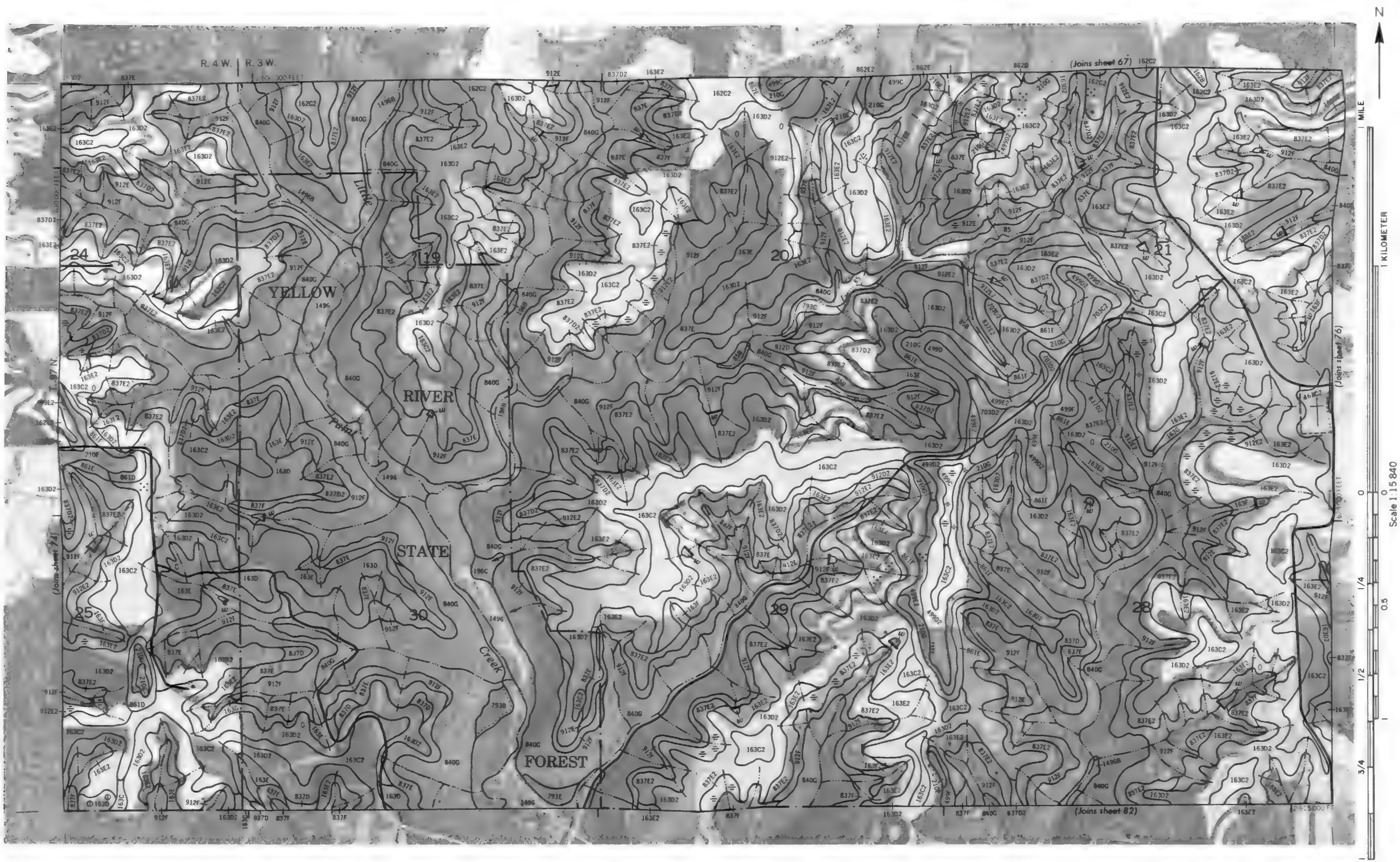
Scale 1:15 840

0 0 1/4 0.5 1/2 3/4



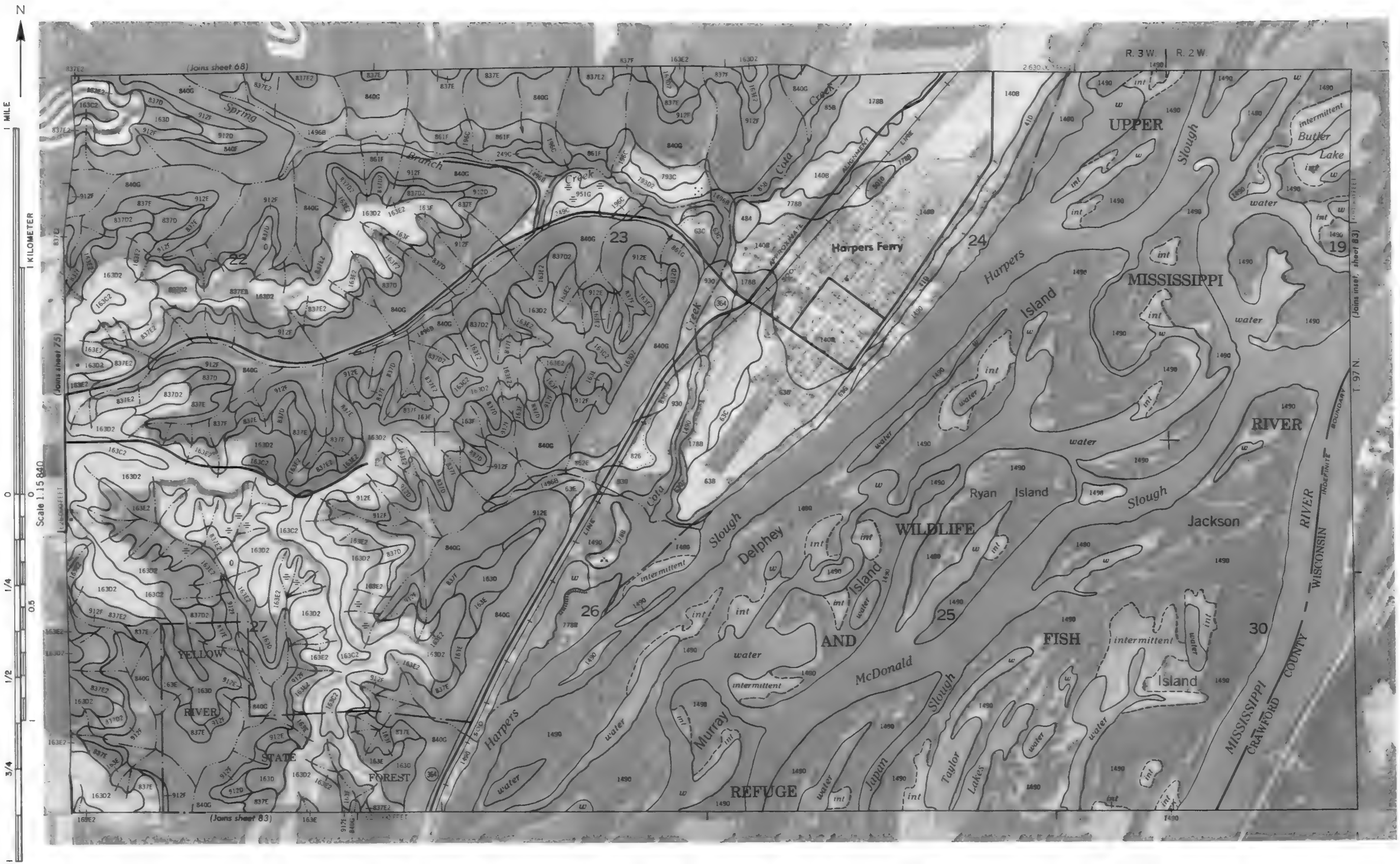
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 74



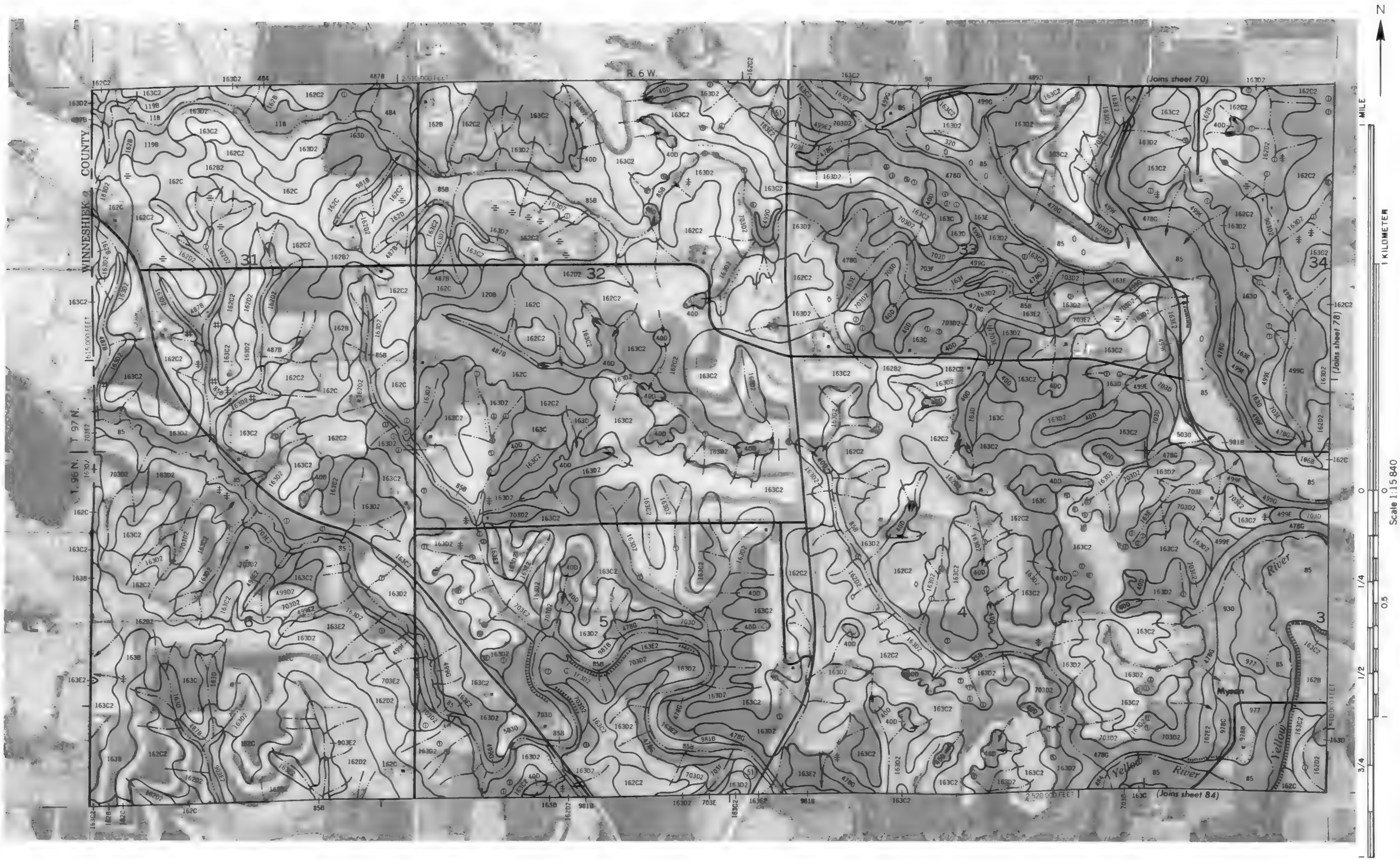
ALLAMAKEE COUNTY, IOWA NO. 75

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

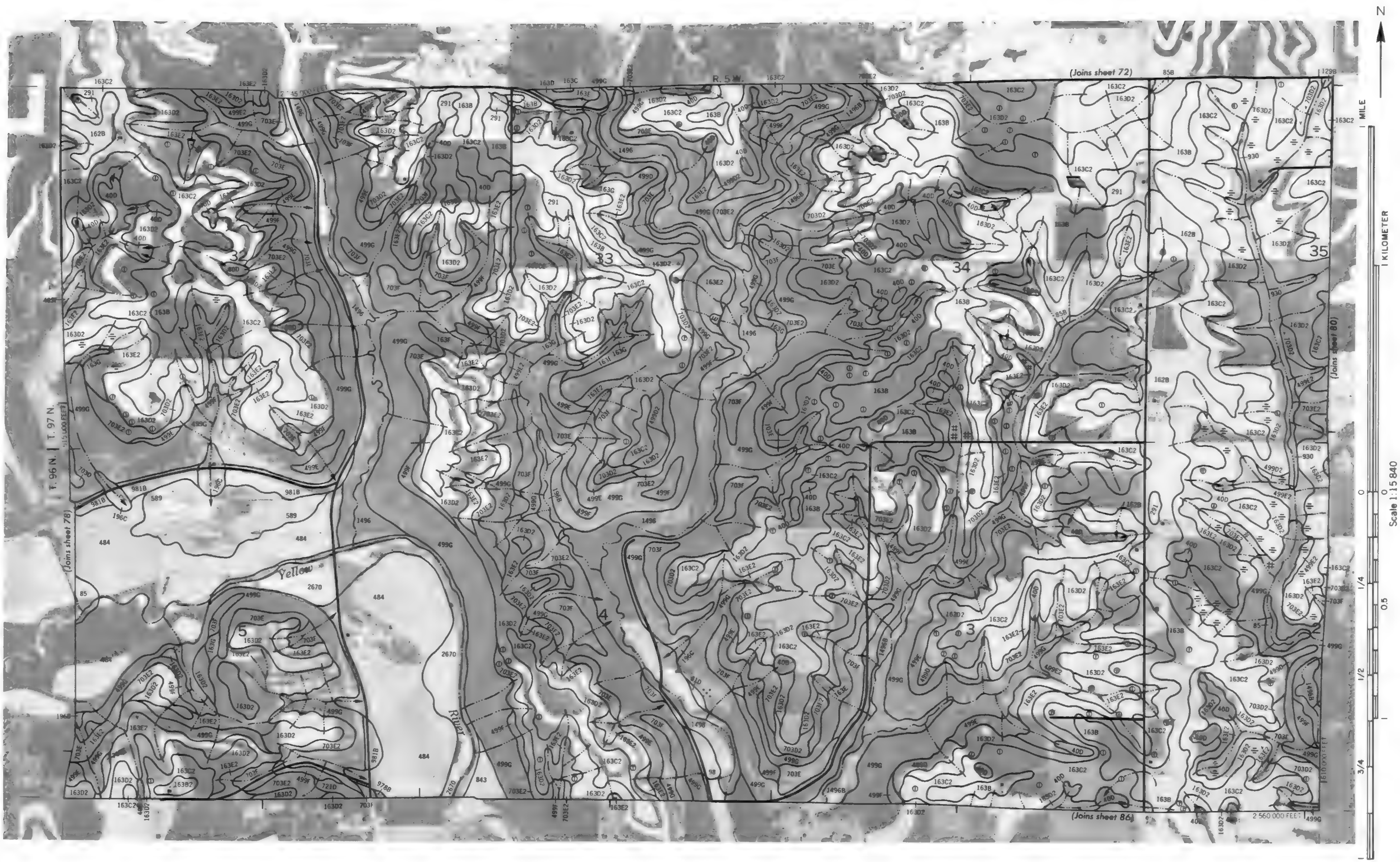
ALLAMAKEE COUNTY, IOWA NO. 76



ALLAMAKEE COUNTY, IOWA NO. 77

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLAMAKEE COUNTY, IOWA NO. 79

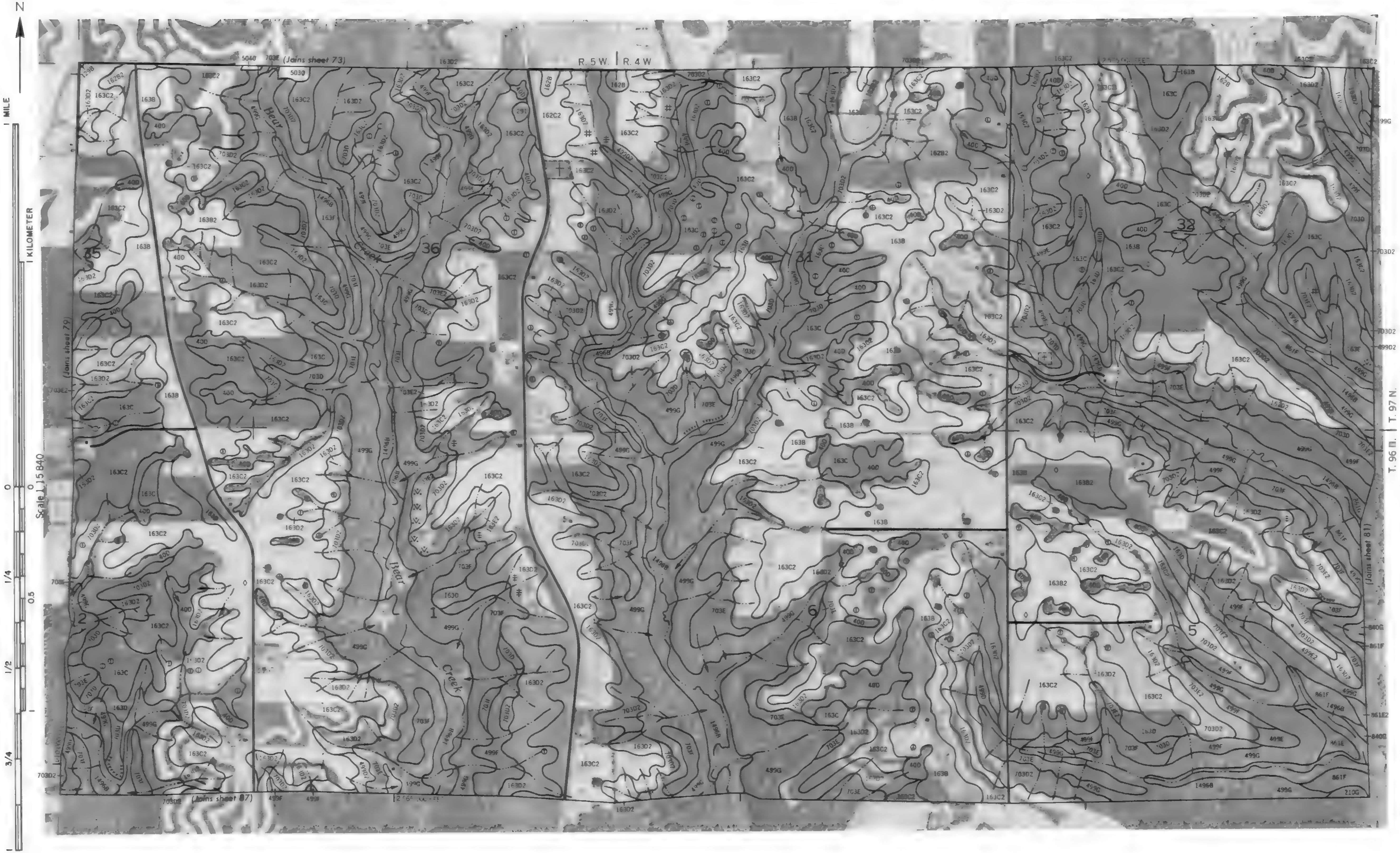
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 8

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 8

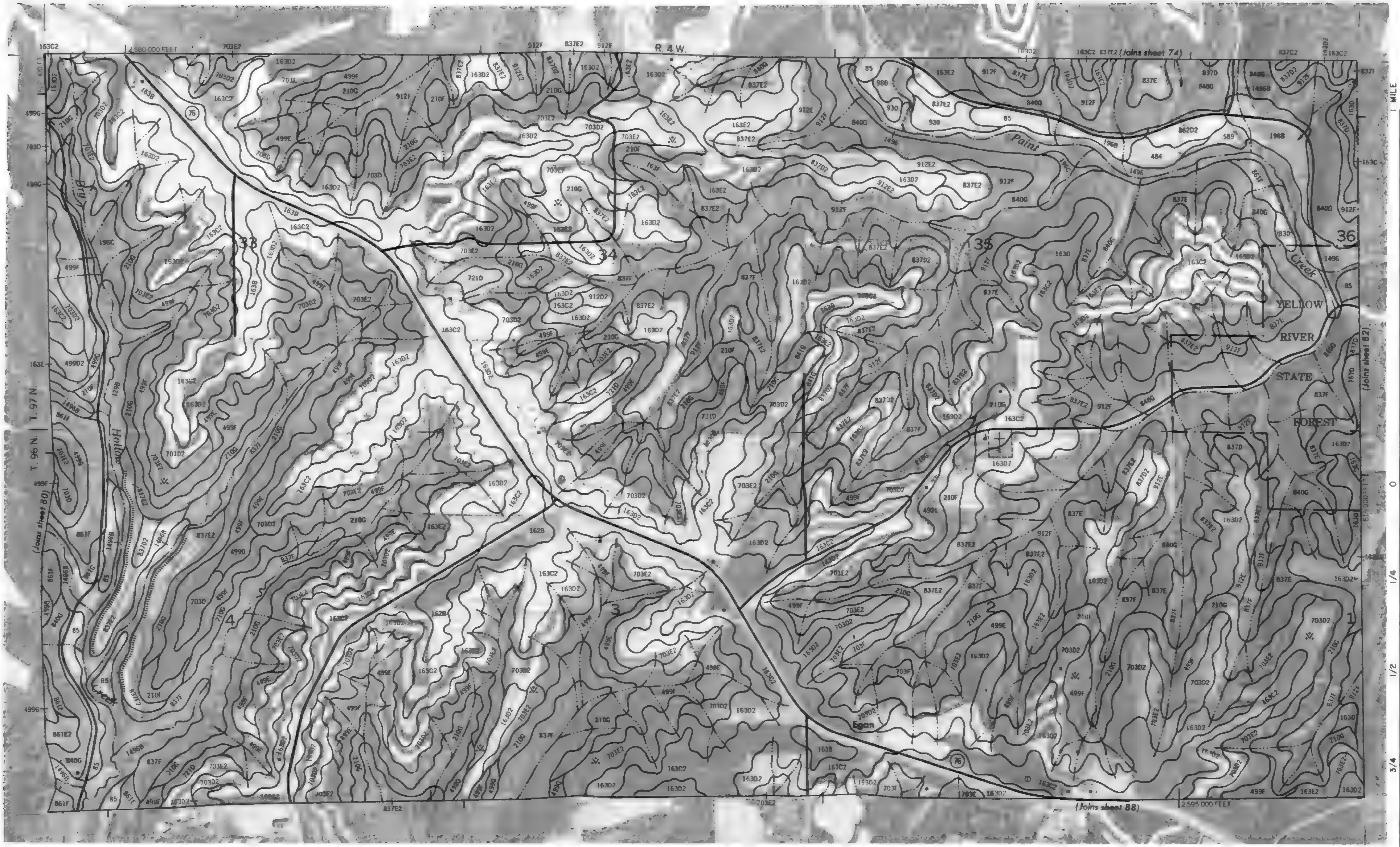
SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 80



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO.

N



1 MILE

1 KILOMETER

0 1/4 1/2 3/4

0 0.5

Scale 1:15 840

ALLAMAKEE COUNTY, IOWA NO. 81

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 82

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

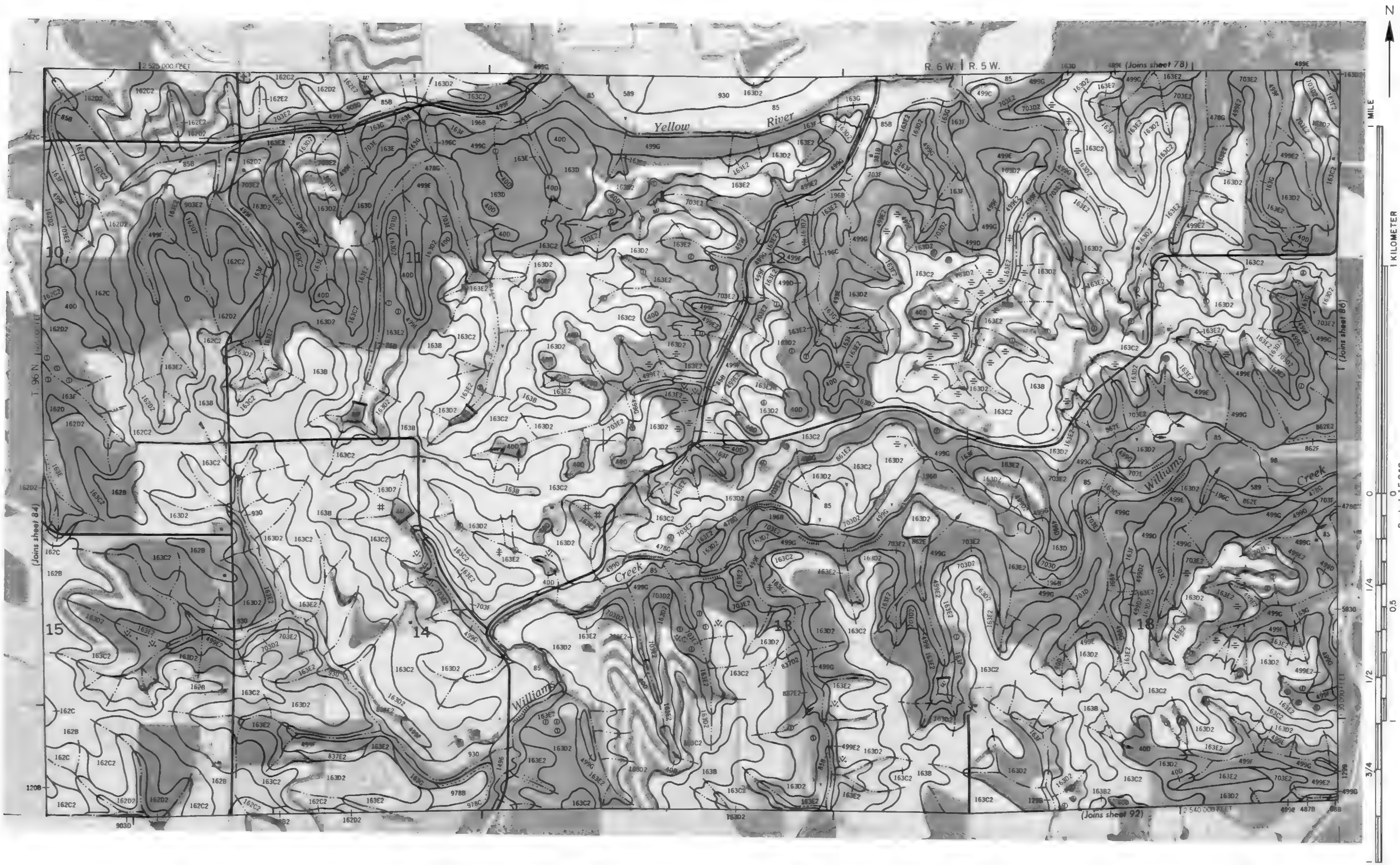
ALLAMAKEE COUNTY, IOWA NO. 82

ALLAMAKEE COUNTY, IOWA NO. 83
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 84

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners if shown are approximately positioned

ALLAMAKEE COUNTY, IOWA NO. 84



ALLAMAKEE COUNTY, IOWA NO. 85

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 86

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 86

87

N

1 MILE

1 KILOMETER

Scale 1:15 840

ALLAMAKEE COUNTY, IOWA NO. 87

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
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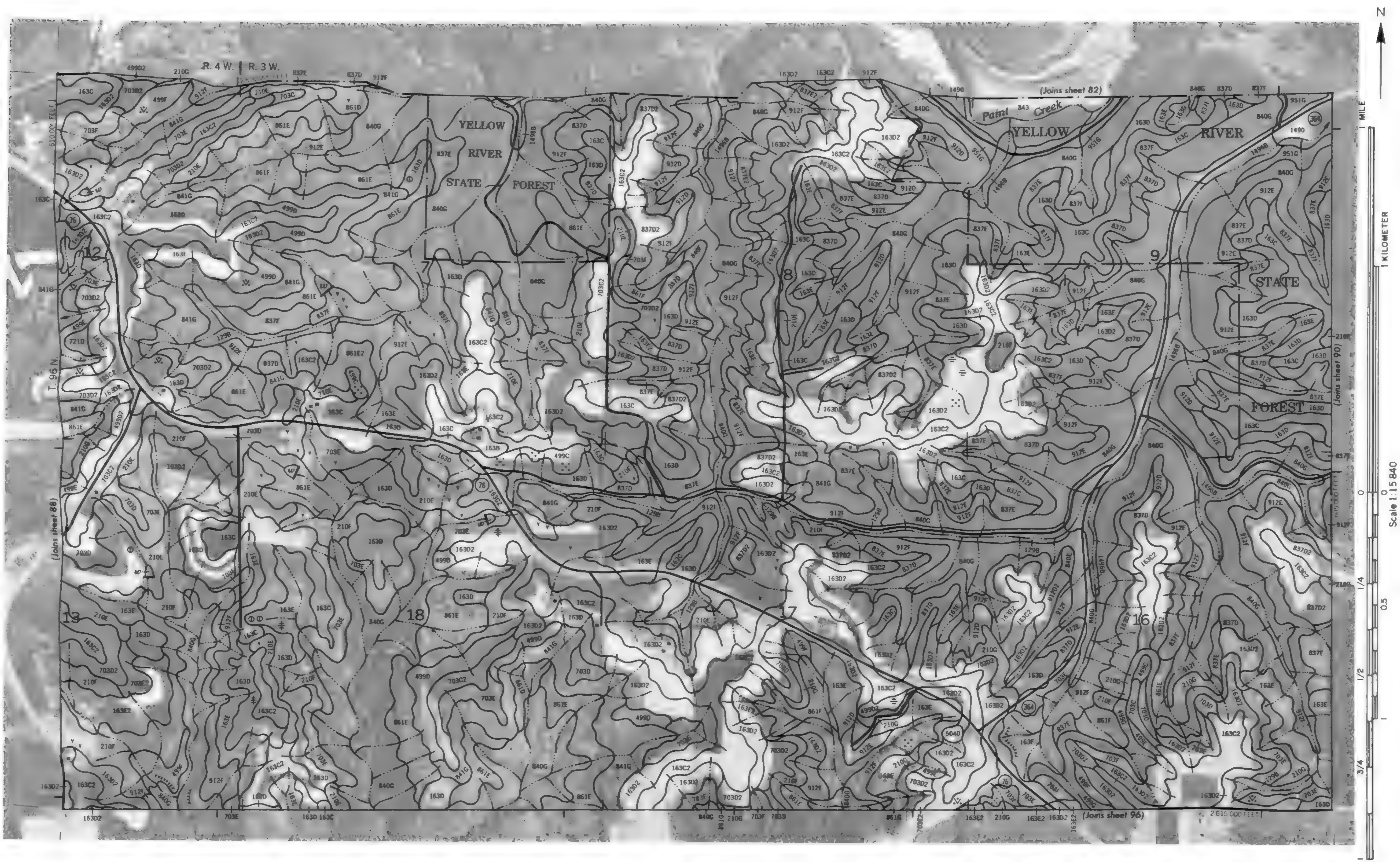
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

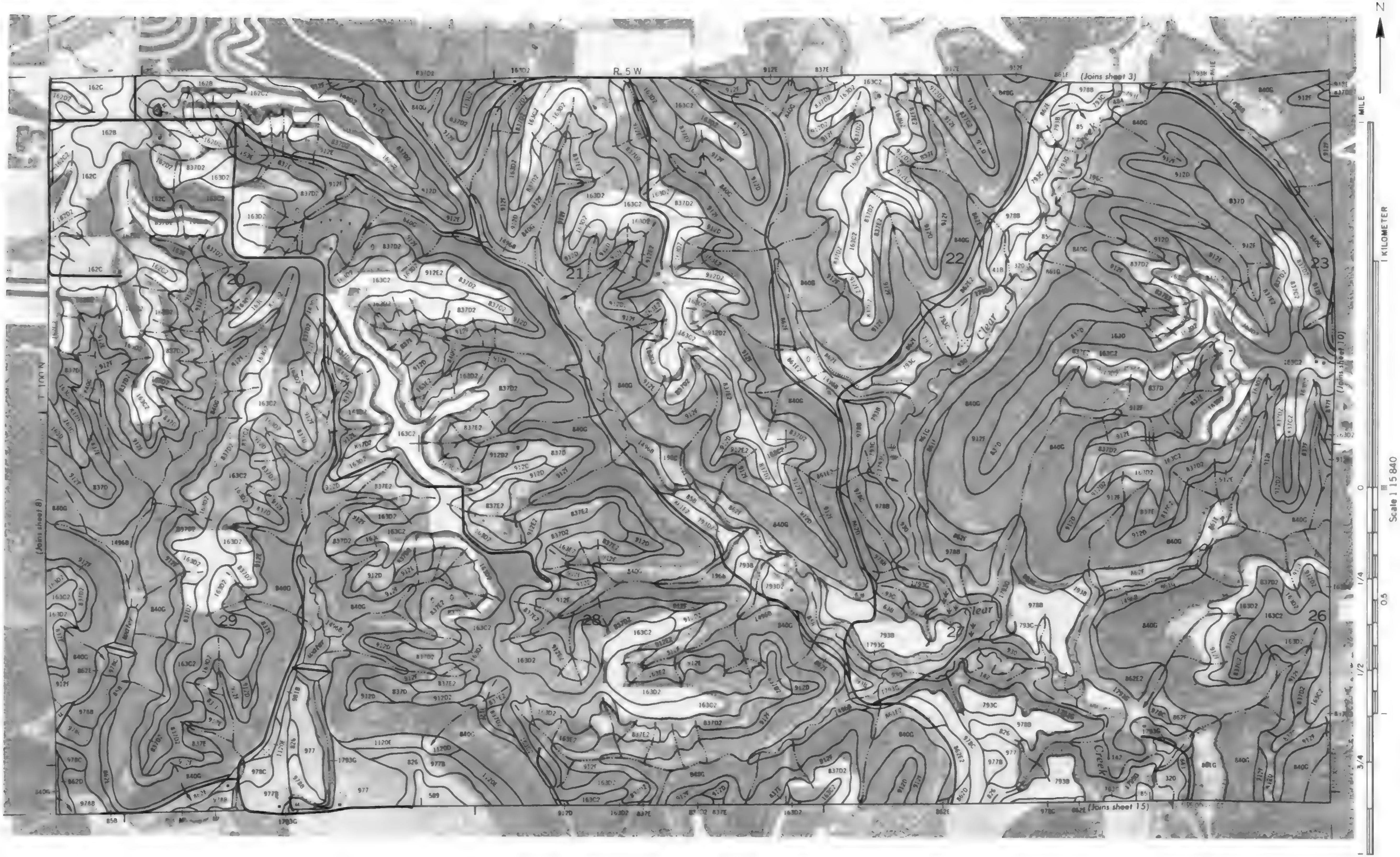


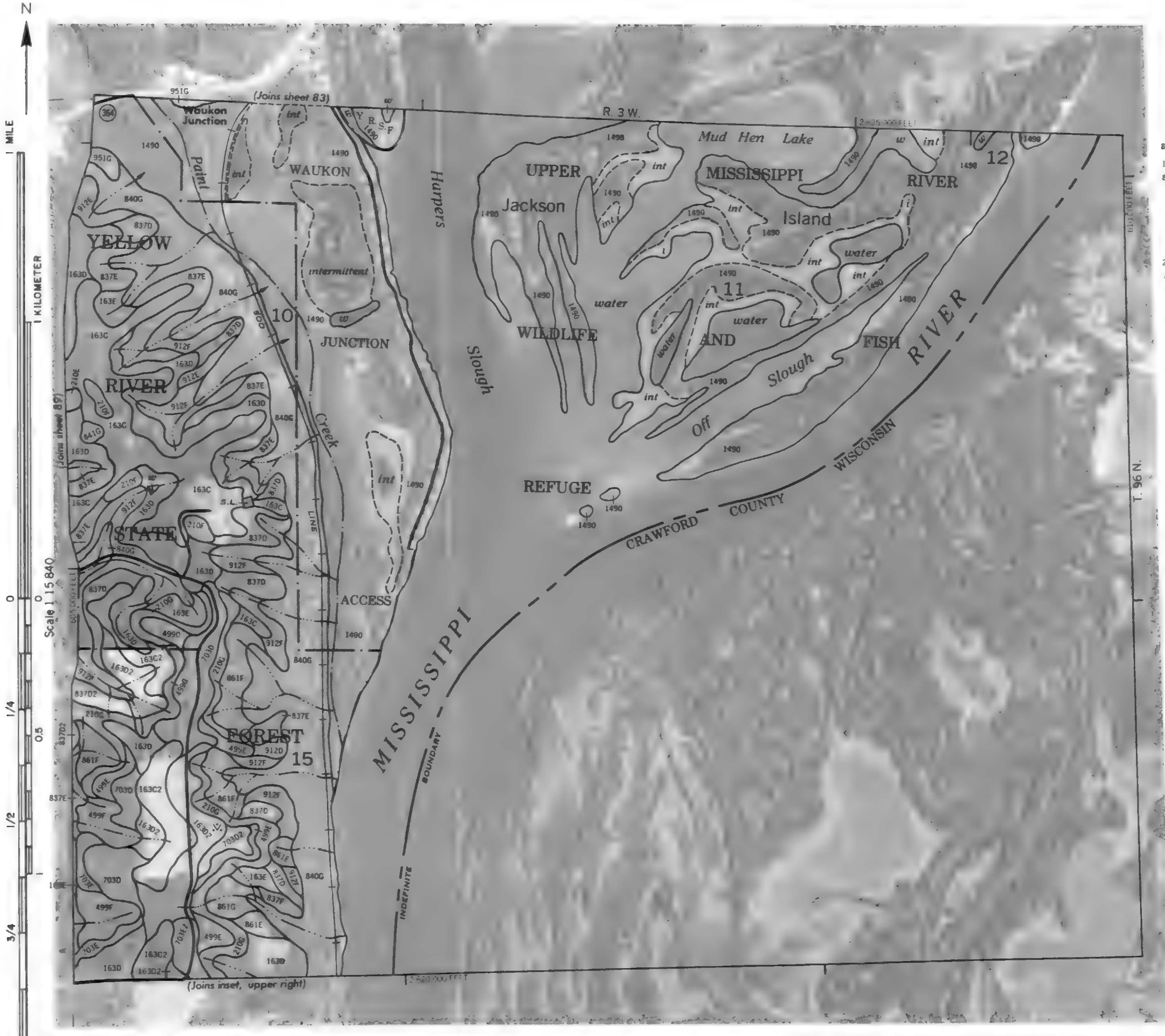
ALLAMAKEE COUNTY, IOWA NO. 89

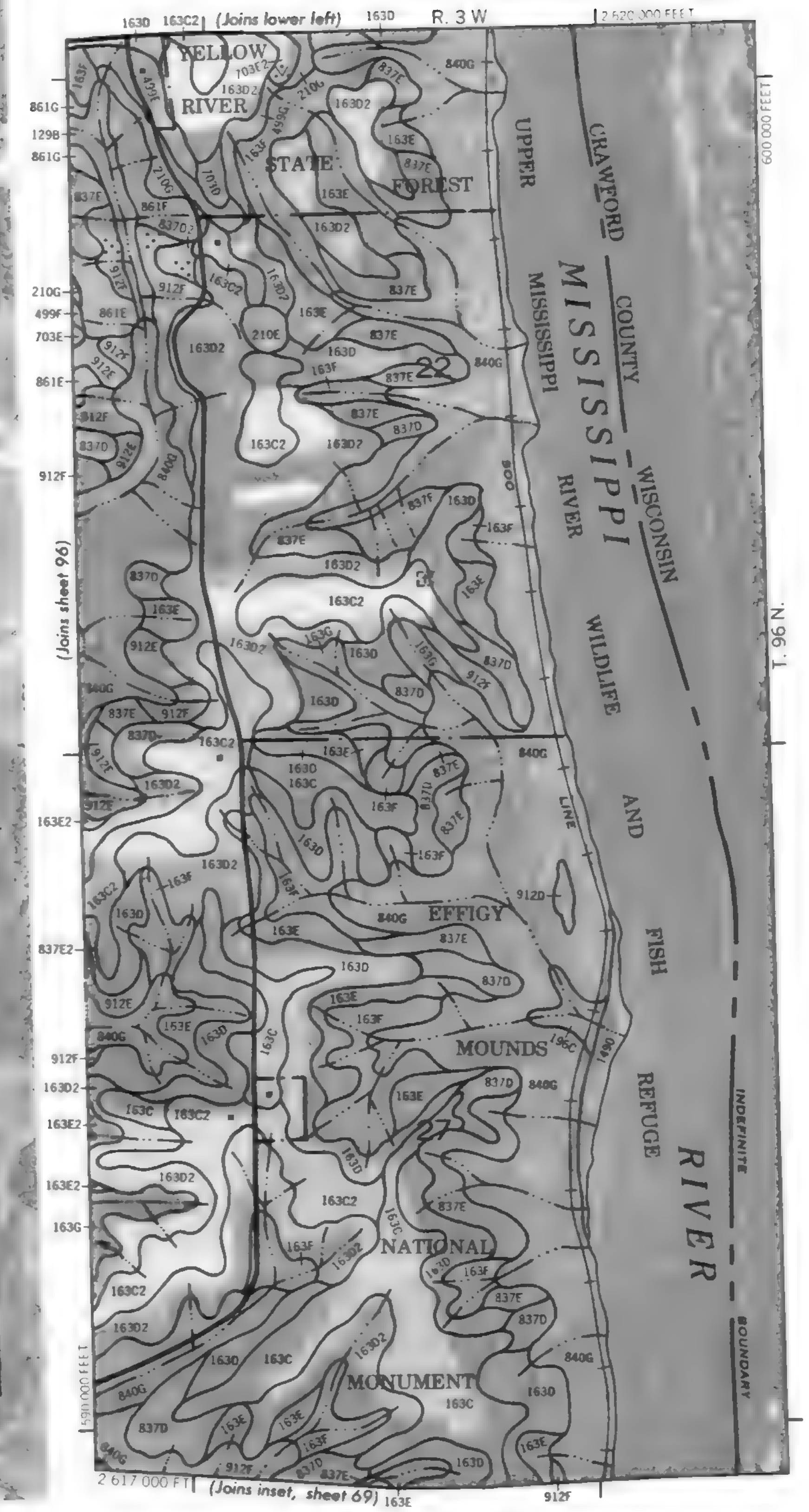
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

ALLAMAKEE COUNTY, IOWA NO. 9

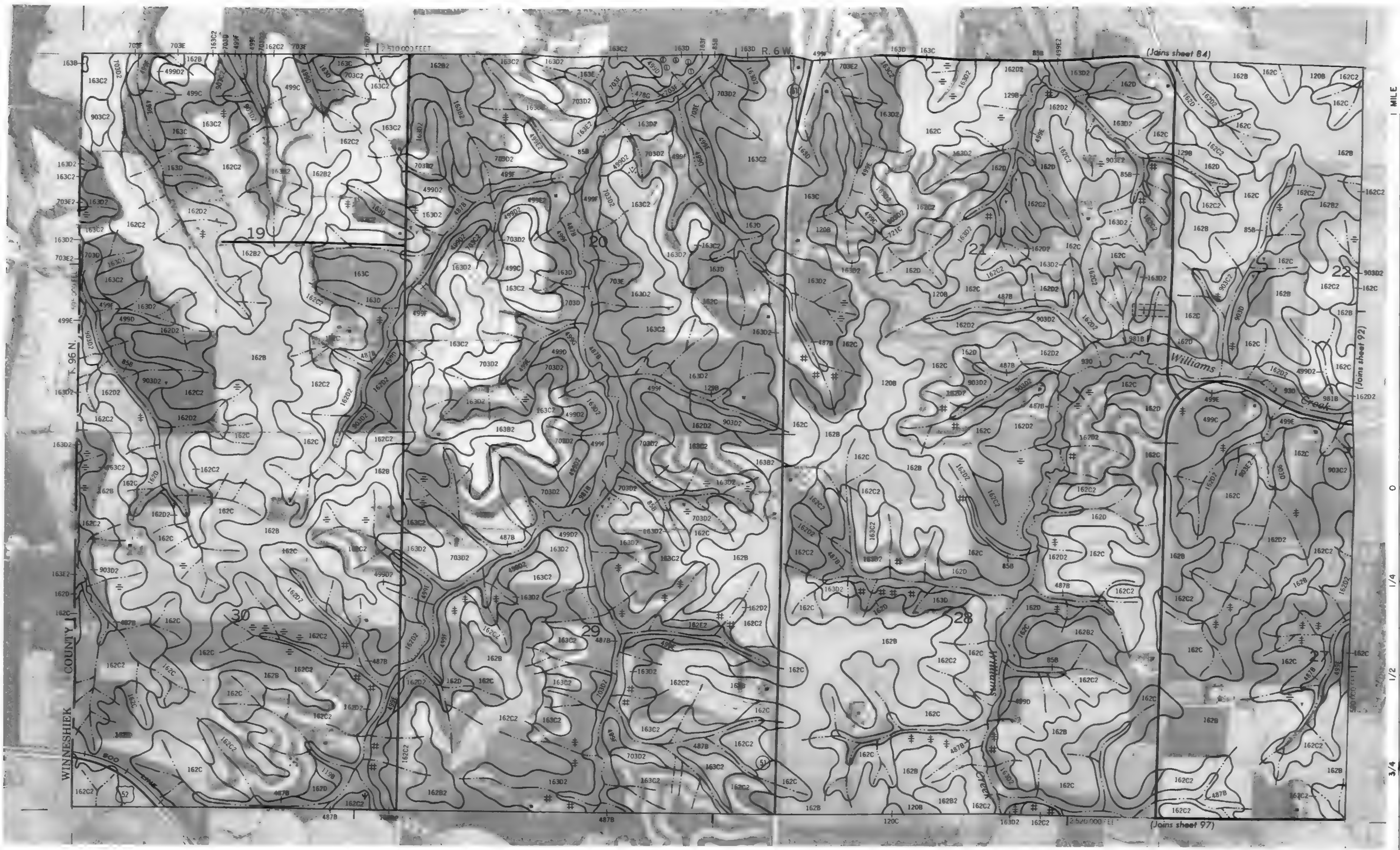
This soil survey map is compiled on 1980 aerial photographs by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.







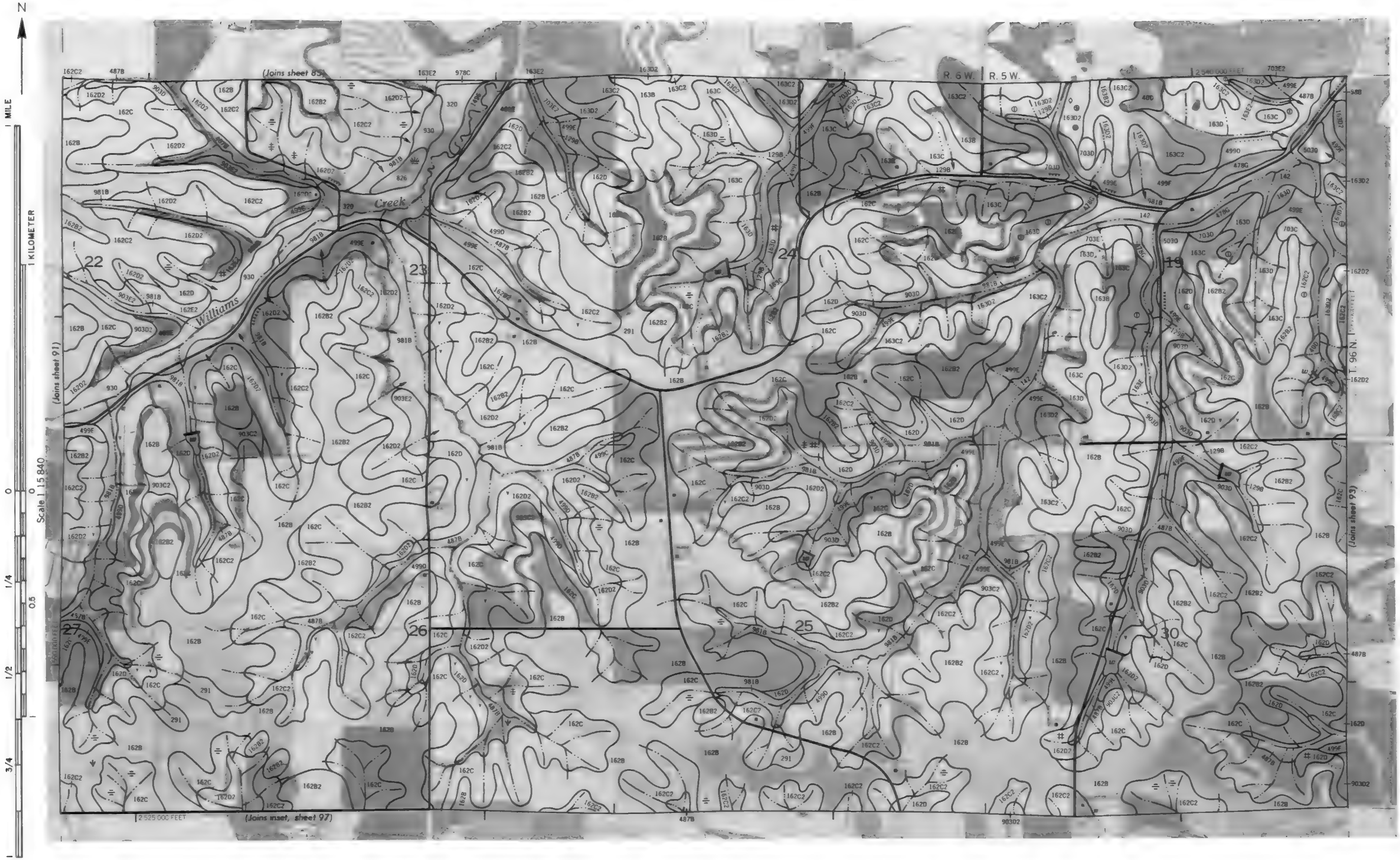
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned



ALLAMAKEE COUNTY, IOWA NO. 91

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 92



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 92

N

ALLAMAKEE COUNTY, IOWA NO. 93

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 MILE

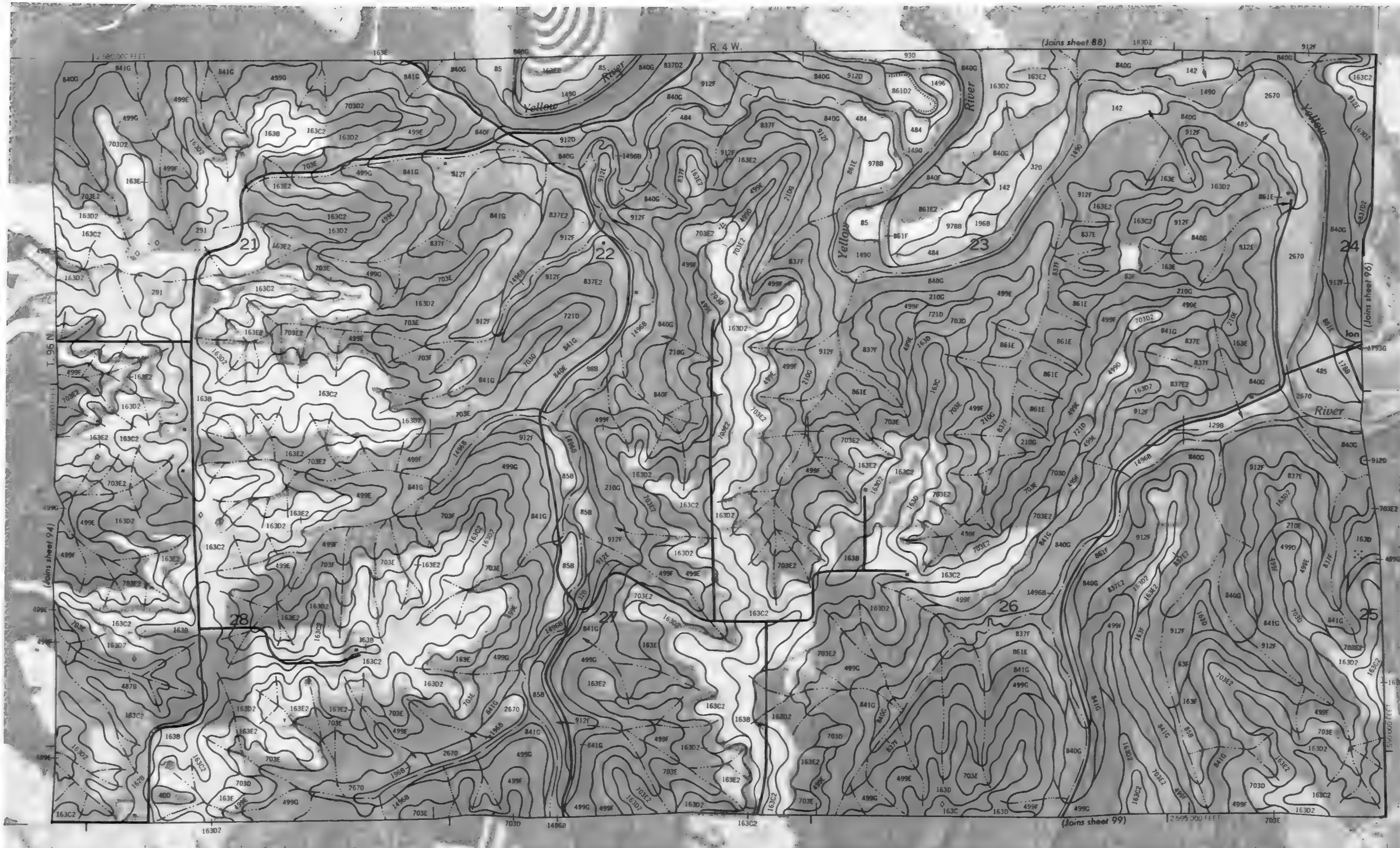
1 KILOMETER

Scale 1:15 840

SOIL MAP OF ALLAMAKEE COUNTY, IOWA — SHEET NUMBER 94

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

ALLAMAKEE COUNTY, IOWA NO. 94



N

MILE

1 KILOMETER

Scale 1:15 840

0

1/4

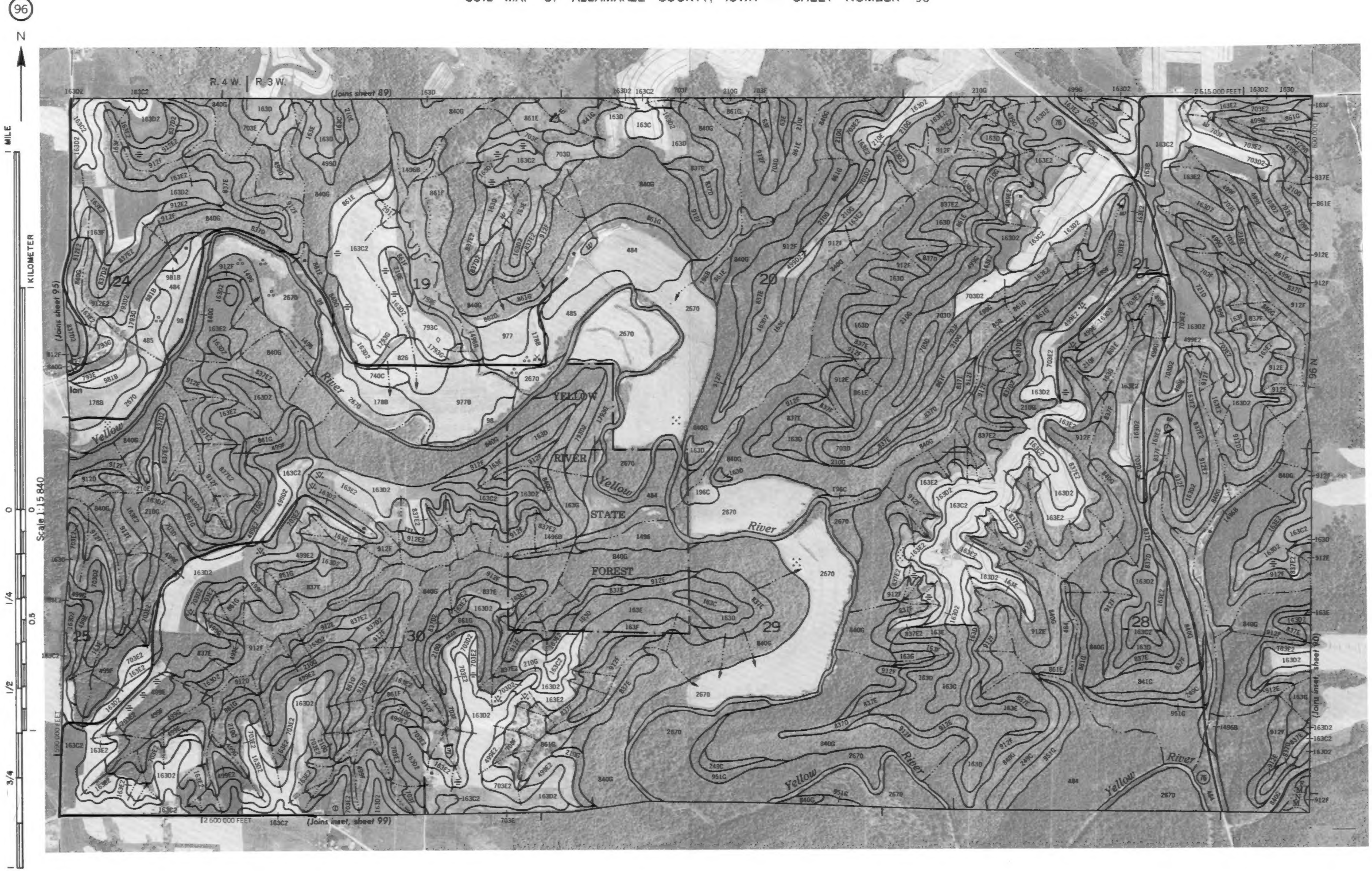
1/2

3/4

0.5

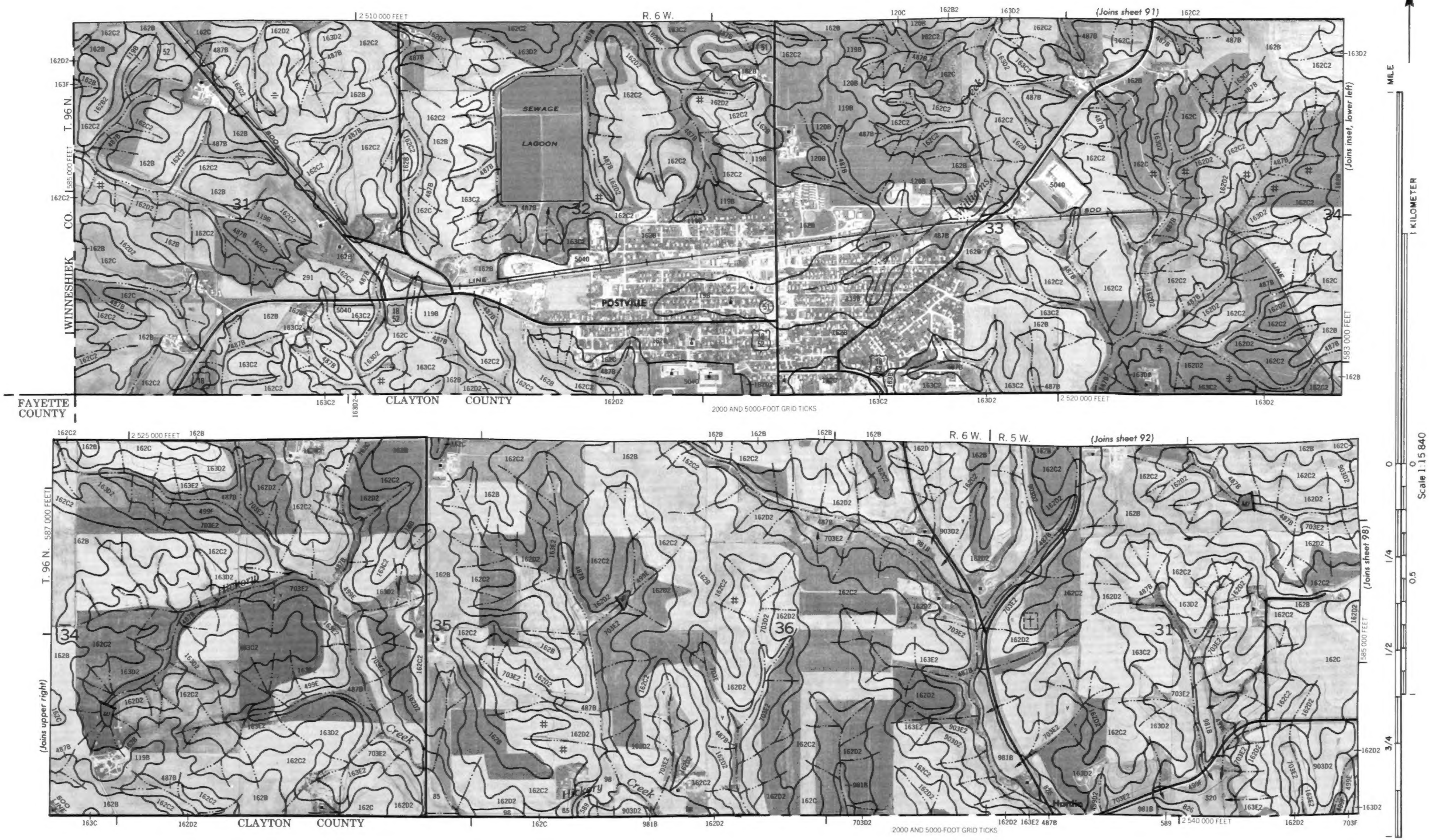
ALLAMAKEE COUNTY, IOWA NO. 95

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned



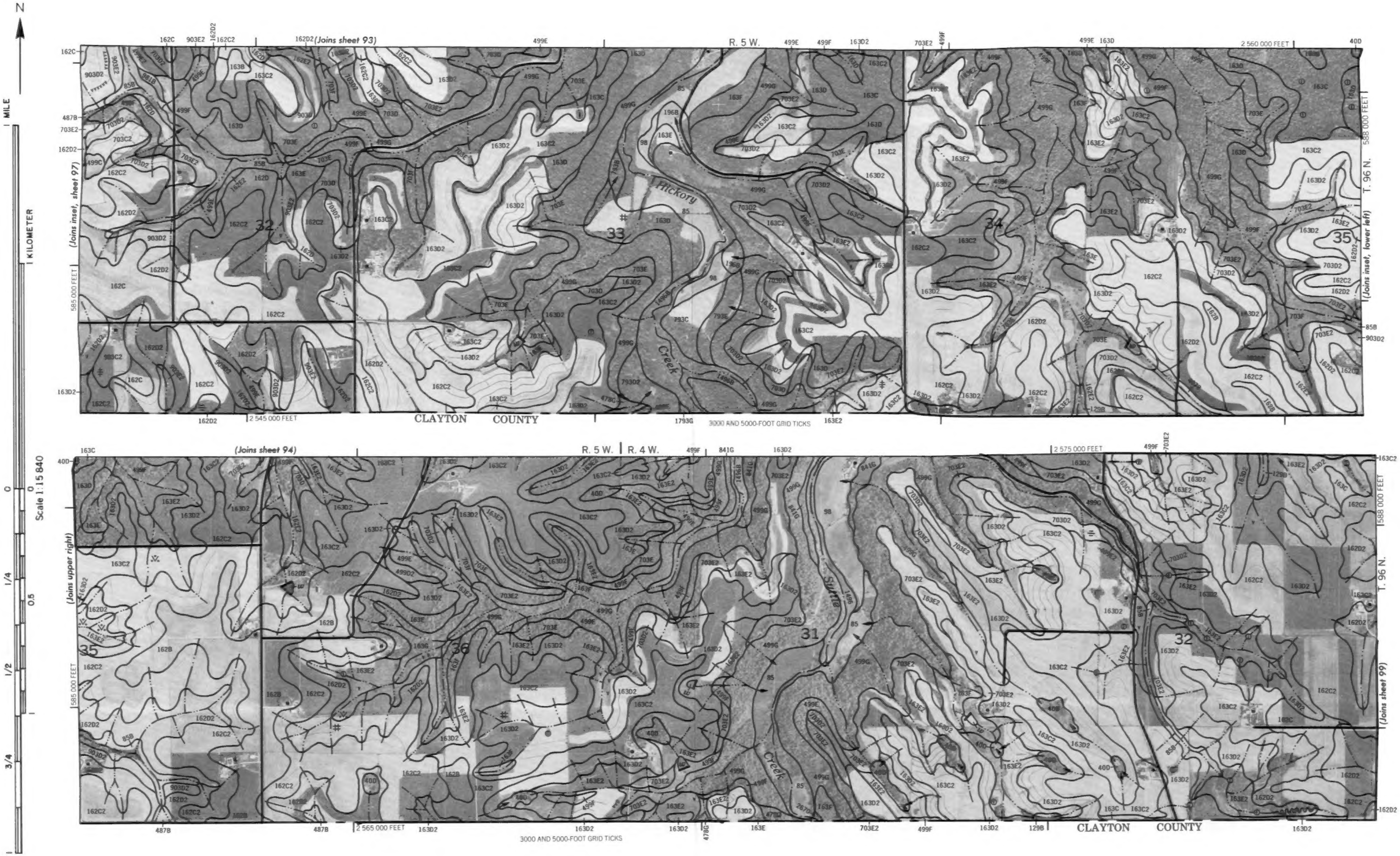
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 96



ALLAMAKEE COUNTY, IOWA NO. 97

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLAMAKEE COUNTY, IOWA NO. 98

ALLAMAKEE COUNTY, IOWA NO. 99

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
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